

LYCOSID SPIDERS OF JAPAN

I. THE GENUS *PIRATA* SUNDEVALL

Hozumi TANAKA

Biological Laboratory, Konko Yao Senior High School,
Yao, Osaka, 581 Japan

Synopsis

TANAKA, Hozumi (Biological Laboratory, Konko Yao Senior High School, Yao, Osaka, 581 Japan: Lycosid spiders of Japan I. The genus *Pirata* SUNDEVALL. *Acta arachnol.*, 36: 33-77 (1988).

The following 13 species of the genus *Pirata* of Japan are dealt with: *Pirata piraticus* (CLERCK), *P. subpiraticus* (BÖSENBERG et STRAND), *P. clercki* (BÖSENBERG et STRAND), *P. yaginumai* TANAKA, *P. piratoides* (BÖSENBERG et STRAND), *P. meridionalis* TANAKA, *P. boreus* TANAKA, *P. procurvus* (BÖSENBERG et STRAND), *P. tanakai* BRIGNOLI, *P. yezoensis* TANAKA, *P. hiroshii* TANAKA, *P. piratellus* (STRAND), and *P. knorrii* (SCOPOLI). One species, *P. piratellus*, has not been collected since it was described originally in 1906. The other 12 species are redescribed in detail, with notes on their biology, and a key to them is provided. All of them live in wet habitats, i.e. around rivers, ponds and lakes, and under fallen leaves etc.

The first paper in this series was published in 1985 (*Acta arachnol.*, 33: 51-87). In it, 13 species belonging to the four genera of the family Lycosidae were described as new. One species *P. hiroshii* was added after the doctoral thesis by this author (1986).

Four species were first described by BÖSENBERG and STRAND (1906), and one was added by STRAND (1907). SAITO (1934) added two species, known in Europe, to the Japanese fauna. Although, he (1939) described two new species, TANAKA (1974) transferred these from *Pirata* to *Pardosa*, and added five species of *Pirata* as new to science. Of these five species, *P. japonica* was synonymized with *P. piratoides* by this author (1980). Afterward, two species were added by this author (1985 and 1986).

Ultimately, 13 species are included in Japanese fauna.

The following abbreviation are used in the text: AME-Anterior median eye; AE-Anterior eyes; AER-Anterior eye row; ALE-Anterior lateral eye;

ASEA-Arachnological Society of East Asia, c/o Otemon Gakuin University, Osaka; PME-Posterior median eye; PMR-Posterior median row; SMF-Senckenberg Museum, Frankfurt; UOP-University of Osaka Prefecture, Sakai.

Acknowledgements

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Genus *Pirata* SUNDEVALL

Pirata SUNDEVALL, 1833, p. 24; ERICHSON, 1845, p. 10; AGASSIZ, 1848, p. 845; THORELL, 1870, pp. 189, 193; —, 1872, p. 271; SIMON, 1876, p. 294; KEYSERLING, 1877, p. 610; MENGE, 1879, p. 512; SCHLECHTENDAL, 1881, p. 76; HANSEN, 1882, p. 70; BECKER, 1882, p. 117; DAHL, 1883, p. 51; EMERTON, 1885, p. 492; STONE, 1890, p. 421; MARX, 1890, p. 564; SIMON, 1898, pp. 328, 333; BOSENBERG, 1901, p. 18; SMITH, 1901, p. 196; —, 1902, p. 329; MONTGOMERY, 1902, pp. 536, 575; BÖSENBERG, 1903, p. 405; MONTGOMERY, 1904, pp. 264, 308; BANKS, 1905, p. 319; SMITH, 1907, p. 91; BANKS, 1907, p. 733; DAHL, 1908, p. 202; FALCONER, 1910, p. 330; LESSERT, 1910, p. 501; DAHL, 1912, p. 583; COMSTOCK, 1913, pp. 621, 641; PETRUNKEVITCH, 1925, p. 174; SAVORY, 1926, p. 133; F. and M. DAHL, 1927, pp. 4, 58; PETRUNKEVITCH, 1928, p. 105; ROEWER, 1928, p. 129; —, 1932, p. 432; CHARITONOW, 1932, p. 22; BERLAND, 1932, p. 130; SAITO, 1934, p. 350; SAVORY, 1935, p. 80; KASTON, 1948, p. 306; LOCKET and MILLIDGE, 1951, p. 287; ROEWER, 1955, p. 769; BONNET, 1958, p. 3654; ROEWER, 1959, p. 823; WIEBES, 1959, p. 57; YAGINUMA, 1960, p. 87; FUHN and NICULESCU-BURLACU, 1971, p. 205; TYSTSCHENKO, 1971, p. 180; TANAKA, 1974, p. 22; WALLACE and EXLINE, 1977, p. 2; YAGINUMA, 1986, p. 167. Type-species: *Araneus piraticus* CLERCK, 1758.

Potamia C.L. KOCH, 1848, p. 48 (preoc.); —, 1851, p. 34; OHLERT, 1851, p. 5; DOLESCHALL, 1852, p. 628; THORELL, 1856, p. 124; SIMATCHKO, 1861, p. 131; SIMON, 1864, p. 352; TACZANOWSKI, 1866, p. 12; OHLERT, 1867, p. 126; MARSCHALL, 1873, p. 396; SCUDDER, 1882, p. 260; SIMON, 1898, p. 347; SHERBORN, 1922, p. 5124; PETRUNKEVITCH, 1928, p. 242; SHERBORN, 1932, p. 876; CHARITONOW, 1932, p. 22. Type-species:

Araneus piraticus CLERCK, 1758.

Tarentula BOSENBERG et STRAND, 1906, p. 314 (part); STRAND, 1906, p. 284; —, 1907, p. 565.

Potamobius SCHEURING, 1914, p. 379. Type-species: *Lycosa (Potamia) palustris* C.L. KOCH, 1848.

Small. Carapace with a V-shaped mark in a light median band. Head not elevated. AER procurved, and the length equal to, or shorter than that of PMR; size of AME equal to, or longer than ALE. Clypeus equal in length to, or shorter than, the diameter of AME. Chelicerae with three teeth on retro-margin. Legs with a spine at prolateral apex of femur I. Palpi without claw in male.

Biological notes: The spiders inhabit various areas, and some species spin the small and scanty webs at their habits. The egg sac is globular and pinkish white.

Remarks: This genus is characterized by the V-shaped mark in the light median band of the carapace. This genus is widely distributed in the world, and the following 13 species occur in Japan.

Key to Japanese species*

1. AME smaller than, or equal to, PME 2
- AME larger than ALE 7
2. Carapace with light lateral bands separated from margins by dark bands..
..... 3
- Carapace with light lateral bands not separated from margins by dark
brown bands 5
3. Patellae and tibiae I black *yesoensis*
- Patellae and tibiae I greyish brown 4
4. Legs with annulations *hiroshii*
- Legs without annulations *tanakai*
5. Carapace with a very narrow dark brown line along margin 6
- Carapace without such a line *knorrii*
6. Carapace with a distinct V-shaped mark, and without a dark line along
margin. AER weakly procurved *clercki*

* *P. piratellus* (STRAND) is not included in the key, because the specimens are not available for study.

- . Carapace with a faint V-shaped mark, and with a very narrow dark brown line along margin. AER strongly procurved *procurvus*
- 7. Carapace with light lateral bands separated from margins by dark brown bands. AER shorter than PMR 8
- . Carapace with light lateral bands not separated from margins by dark brown bands. AER equal in length to PMR 11
- 8. Carapace with a very narrow dark brown line along margin 9
- . Carapace without such a line 10
- 9. Clypeal length shorter than the half diameter of AME *piratoides*
- . Clypeal length about as high as the diameter of AME *meridionalis*
- 10. Legs with annulations. AER straight or weakly procurved *yaginumai*
- . Legs without annulations. AER procurved *boreus*
- 11. Clypeal length slightly shorter than the diameter of AME. Diameter of AME about 1.5 times as large as ALE. *piraticus*
- . Clypeal length shorter than half the diameter of AME. Diameter of AME about two times as large as ALE *subpiraticus*

***Pirata piraticus* (CLERCK, 1758)**

[Japanese name: Kaizoku-komorigumo]

(Figs. 1-4)

Araneus piraticus CLERCK, 1758, p. 102, pl. 5, fig. 4.

Aranea piratica: OLIVIER, 1789, p. 218.

Lycosa piratica: WALCKENAER, 1805, p. 14; HAHN, 1831, p. 107, fig. 80; WALCKENAER, 1837, p. 339; C.L. KOCH, 1848, p. 1, figs. 1413-1414; BLACKWALL, 1861, p. 34, pl. 2, fig. 16; THORELL, 1872, p. 341; LESSERT, 1910, p. 504; SIMON, 1937, pp. 1118, 1140, figs. 1769-1770.

Pirata piraticus: SUNDEVALL, 1833, p. 24; SIMON, 1876, p. 300, pl. 12, figs. 7-8; MENGE, 1879, p. 513, pl. 83, fig. 290; BECKER, 1882, p. 122, pl. 9, fig. 9; DAHL, 1883, p. 64; CHYZER and KULCZYNSKI, 1891, p. 76; BOSENBERG, 1903, p. 406, pl. 38, fig. 598; DAHL, 1908, p. 287, fig. 34; —, 1912, p. 584; F. and M. DAHL, 1927, p. 64, figs. 166-169; REIMOSER, 1928, p. 107, fig. 5; KRATOCHVIL, 1930, pp. 2, 4, figs. 4; SAITO, 1934, p. 351, pl. 15, fig. 81; GERTSCH and WALLACE, 1937, p. 5; PALMGREN, 1939, p. 70, figs. 104, 109, 115; KASTON, 1938, p. 16, fig. 1; HOLM, 1947, p. 10, fig. 4, pl. 1, figs. 7-8, pl. 9, fig. 4; KASTON, 1948, p. 309, pl. 5, fig. 1003, pl. 51, fig. 1010; LOCKET and MILLIDGE, 1951, p. 287, fig. 139; ROEWER, 1954, p. 284; BONNET, 1958, p. 3664; BRAENDEGAAD, 1958, p. 22, figs. 13-14; SAITO, 1959, p. 58, pl. 5, fig. 44, pl. 6, fig. 44; WIEBES, 1959, p. 61, figs. 82, 92, 104, 105; KEKENBOSCH, 1967, p. 262; YAGINUMA, 1970, p. 667; FUHN and NICULESCU-BURLACU, 1971, p. 213, fig. 104;

TYSTSCHENKO, 1971, p. 182, fig. 530; TANAKA, 1974, p. 23, pl. 1, figs. 1-3; NAMKUNG, 1976, p. 85; YAGINUMA, 1977, p. 395; PAIK and NAMKUNG, 1979, p. 68, fig. 53; KRONESTEDT, 1980, p. 68, figs. 2(A), 3(B,D), 4(A), 5, 6(A-C), 7(D-F), pl. 1(A); SOHN and PAIK, 1981, p. 21; HU, 1984, p. 243; PAIK and KIM, 1985, p. 69; YAGINUMA, 1986, p. 167, fig. 92.

Potamia piratica: THORELL, 1856, p. 63.

Pirata piratica: SAITO, 1941, p. 124, fig. 142; YAGINUMA, 1960, p. 87, pl. 41, fig. 233.

Lycosa argenteomarginata LUCAS, 1846, p. 120, pl. 3, fig. 10.

Potamia argenteomarginata: SIMON, 1864, p. 352.

Lycosa febriculosa BECKER, 1881, p. 45, pl. 2, fig. 2.

Pirata febriculosa: CHAMBERLIN, 1908, p. 311, pl. 22, figs. 1-2; COMSTOCK, 1912, p. 645, fig. 724.

Lycosa wacondana: SCHEFFER, 1904, p. 260, pl. 17, fig. 7.

Pirata wacondana: CROSBY and BISHOP, 1928, p. 1069.

Pirata sylvestris EMERTON, 1909, p. 209, pl. 6, fig. 8.

Female

Specimen measured: Yukomanbetsu, Hokkaido, 13. VII. 1973 (H. TANAKA).

Measurements (mm). Total length 8.35. Carapace length 4.25, width 3.15.

Abdomen length 4.10, width 2.90.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	3.10	3.85	2.60	1.30	10.85
II	2.90	3.50	2.40	1.20	10.00
III	2.75	3.20	2.50	1.25	9.70
IV	3.55	4.50	4.00	1.60	13.65
Palp	1.50	1.80	—	1.15	4.45

Carapace yellowish brown, with brown markings and a very narrow dark brown line along margin; V-shaped mark distinct, reddish brown; light yellow lateral bands broad, with white pubescence. AER equal to PMR; diameter of AME about 1.5 times as large as that of ALE; AME separated from each other by about half the diameter of AME, and from ALE by length being smaller than half the diameter of AME; AER procurved. Clypeus brown, slightly shorter than the diameter of AME. Chelicerae reddish brown. Maxillae yellowish brown, lighter at apex. Labium reddish brown. Sternum light yellowish brown, with black patches opposite first three pairs of coxae. Abdomen reddish brown; a lanceolate median mark very distinct; lateral sides reddish brown, with white pubescence; ventral side yellowish brown. Legs dark yellowish brown; metatarsus I with three ventral apical spines. Palpi dark yellowish brown. Epigynum with earlike structures at lateral sides (Fig.

1); a pair of spermathecae bottle-shaped and spatulate present as in Fig. 2.

Male

Specimen measured: Yukomanbetsu, Hokkaido, 13. VII. 1973 (H. TANAKA).

Measurements (mm). Total length 6.35. Carapace length 3.25, width 2.40. Abdomen length 3.10, width 2.00.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	2.65	3.00	2.30	1.20	9.15
II	2.40	2.70	2.10	1.10	8.30
III	2.20	2.45	2.10	1.00	7.75
IV	2.90	3.55	3.25	1.35	11.05
Palp	1.40	1.50	—	1.00	3.90

Similar to the female, but different from it in the following features: AER weakly procurved. Palpi; tarsal organs (Figs. 3-4) with an obtuse median apophysis bearing a pointed projection.

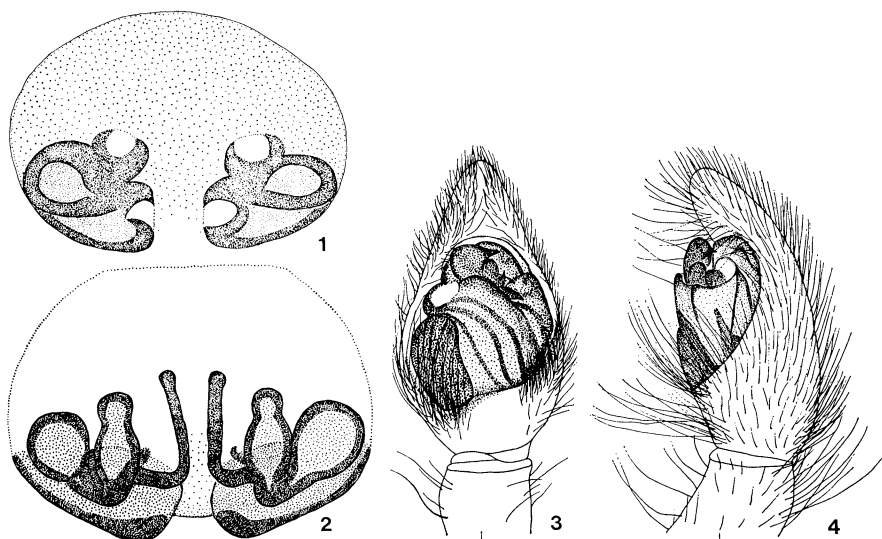
Variation: Total length ♀ 5.75-9.25, ♂ 4.35-6.40. Carapace length ♀ 2.75-4.25, ♂ 2.25-3.30; width ♀ 2.05-3.15, ♂ 1.65-2.45. Abdomen length ♀ 3.00-5.00, ♂ 2.10-3.10; width ♀ 2.15-3.65, ♂ 1.45-2.00. All the specimens examined are similar in coloration. The clypeus ranges 1.0-1.2 times the diameter of AME. In some examples, there are faint annulations on femora of all the legs. The number of ventral apical spines on the metatarsus I is two in some examples.

Material examined: Hokkaido-17♀♀, 3♂♂, Shiretokogoko, 13. VII. 1971 (H. TANAKA); 1♂, Aizankei, 10-11. VII. 1971 (H. TANAKA); 7♀♀, 9♂♂, Yukomanbetsu, 13. VII. 1973 (H. TANAKA); 1♀, 1♂, Onumakoen, 24. VII. 1971 (H. TANAKA); Honshu- 1♀, 1♂, Yonezawa-city, Yamagata Pref., 5. VIII. 1984 (H. YOSHIDA); 1♀, Chuzenji, Nikko, Tochigi Pref., 12. VII. 1973 (H. SAITO); 1♀, Kusatsu-shirane, Gunma Pref., 13. VIII. 1979 (A. TANIKAWA); 14♀♀, 3♂♂, Shiga-kogen, Nagano Pref., 25-28. VII. 1977 (H. TANAKA).

Distribution: Japan (Hokkaido and Honshu); widely distributed in the Holarctic region.

Biological notes: This spider lives on the shores of the ponds, lakes and rivers. Mature spiders appear and the formation of egg sac is found in July. The number of eggs varies from 50 to 130 in one egg sac.

Remarks: This species is very closely related to *P. subpiraticus* (BÖSENBERG et STRAND), occurring in Japan, Korea, and China. It is difficult to separate them by the epigynum, but easy to separate from *subpiraticus* by the absence



Figs. 1-4. *Pirata piraticus* (CLERCK). 1. Female epigynum (ventral view). 2. Female epigynum (dorsal view). 3. Male palp (ventral view). 4. Male palp (retrolateral view).

of the small apical process on the median apophysis of the male palp as shown in Fig. 3. The clypeus is higher than in *subpiraticus* and the ratio in diameter of the AME to the ALE is larger than that of *subpiraticus*.

***Pirata subpiraticus* (BOSENBERG et STRAND, 1906)**

[Japanese name: Kibara-komorigumo]

(Figs. 5-8)

Tarentula (Pirata) subpiratica BÖSENBERG et STRAND, 1906, p. 319, pl. 13, fig. 339.

Pirata subpiratica: SAITO, 1941, p. 126, fig. 145; —, 1959, p. 59, pl. 5, fig. 47, pl. 6, fig. 47.

Pirata subpiraticus: ROEWER, 1954, p. 288; BONNET, 1958, p. 3672; YAGINUMA, 1970, p. 667; TANAKA, 1974, p. 25, pl. 1, figs. 4-6; YAGINUMA, 1977, p. 395; SONG et al., 1978, p. 4, fig. 7; PAIK and NAMKUNG, 1979, p. 68, fig. 54; SOHN and PAIK, 1981, p. 22; WANG, 1981, p. 120, fig. 60; ZHU, 1983, p. 76; PAIK and KIM, 1985, p. 69; YAGINUMA, 1986, p. 169, fig. 92.

Female

Specimen measured: Onumakoen, 11. VII. 1973 (H. TANAKA).

Measurements (mm). Total length 7.30. Carapace length 3.35, width 2.60. Abdomen length 3.95, width 2.60.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	2.50	3.20	2.10	1.10	8.90
II	2.40	2.75	2.00	1.00	8.15
III	2.25	2.65	2.10	1.00	8.00
IV	3.20	3.90	3.45	1.30	11.85
Palp	1.25	1.30	—	0.95	3.50

Carapace yellowish brown, with brown markings, white pubescence, and a very narrow dark brown line along margin; V-shaped mark distinct, greyish brown, light yellow lateral bands broad. AER equal to PMR; diameter of AME about two times as large as that of ALE; AME separated from each other by about half the diameter of AME, and from ALE by the length being smaller than half the diameter of AME; AER weakly procurved. Clypeus yellowish brown, shorter than half the diameter of AME. Chelicerae dark reddish brown. Maxillae yellowish brown. Labium greyish brown. Sternum light yellowish brown, with dark brown patches along margin. Abdomen yellowish brown; a lanceolate median mark distinct; lateral sides yellowish brown, with blackish grey markings and white pubescence; venter yellowish brown. Legs greyish brown with indistinct annulations on femora I-IV; metatarsus I with two ventral apical spines. Palpi greyish brown. Epigynum with paired spatulate structures along lower margin and indistinct stalked spermathecae at the upper part are seen through body wall (Fig. 5); two pairs of spatulate spermathecae present as shown in Fig. 6.

Male

Specimen examined: Onumakoen, Hokkaido, 11. VII. 1973 (H. TANAKA).

Measurements (mm). Total length 5.45. Carapace length 3.05, width 2.20. Abdomen length 2.40, width 1.55.

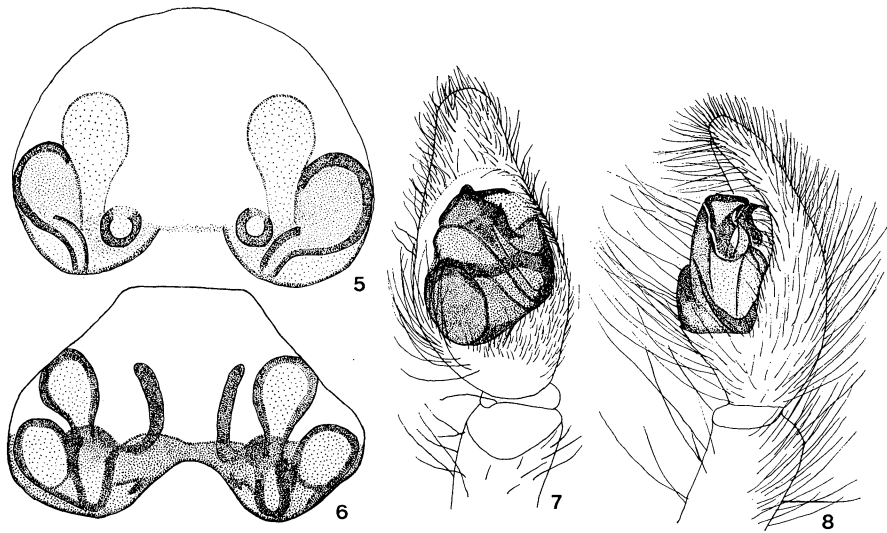
Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	2.70	3.30	2.50	1.15	9.65
II	2.45	2.80	2.20	1.05	8.50
III	2.25	2.45	2.15	0.90	7.75
IV	3.05	3.65	3.30	1.30	11.30
Palp	1.25	1.05	—	0.95	3.25

With characters of female, differing in the palpal tarsal organs (Figs. 7-8) with median apophysis, which has long and slender margin and a small process

at apex.

Variation: Total length ♀ 5.20-7.70, ♂ 5.20-6.35. Carapace length ♀ 2.60-3.70, ♂ 2.80-3.55; width ♀ 1.95-2.75, ♂ 2.35-2.85. Abdomen length ♀ 2.60-4.00, ♂ 2.40-3.80; width ♀ 1.70-2.90, ♂ 1.50-1.95. The color varies from light yellowish brown to greyish brown. The light yellow lateral bands on the carapace are separated from the margins by the faint yellowish brown markings in some specimens. In some samples, the very narrow dark brown line along margin on the carapace is absent or faint. On the dorsum of the abdomen of some individuals, there are four or five obscure dark brown transverse bars. These bars end with a spot of white pubescence in each side. The number of the apical ventral spine on the metatarsus I is three in a few specimens.

Material examined: Hokkaido-2♀, Yukomanbetsu, 9. VI. 1963 (T. AKIYAMA); 1♀, Kamikawa, 10. VII. 1971 (H. TANAKA); 1♀, Sapporo, 25. IX. 1974 (M. SUWA); 5♀♀, 1♂, Onumakoen, 24. VII. 1971 (H. TANAKA); 19♀♀, 4♂♂, same locality, 1. VII. 1973 (H. TANAKA); Honshu-1♂, Hirosaki, Aomori Pref., 4. VI. 1982 (K. TANAKA); 1♀, same locality, 3. VII. 1982 (K. TANAKA); 2♀♀, 2♂♂, Niida, Akita Pref., VI-VII. 1970 (S. KOYAMA); 2♀♀, 1♂, Akayu, Yamagata Pref., 21. V. 1959 (S. NISHIKI); 1♀, 1♂, Ogura, Yamagata Pref., 28. VII. 1984 (H. YOSHIDA); 1♂, Sendai, Miyagi Pref., VI. 1972 (S. KOBAYASHI); 2♀, 2♂, Numata, Gunma Pref., 23. VI. 1984 (H. TANAKA); 1♀, Toyoshina, Nagano Pref., 1. VIII. 1983 (W. MIYATA); 6♀♀, 1♂, Hidaka-cho, Saitama Pref., 1972 (Y. FUJII); 1♀, same locality, 21. IV. 1973 (H. TANAKA); 1♀, same locality, 23. VII. 1981 (Y. FUJII); 1♀, Hachioji, Tokyo, 10. XI. 1983 (S. TAKANO); 1♂, Taihizan, Kyoto Pref., 1. X. 1970 (H. TANAKA); 15♀♀, 3♂♂, Midoroga-ike, Kyoto Pref., 18. VII. 1980 (H. TANAKA); 1♀, Senriyama, Osaka Pref., 21. VI. 1939 (T. YAGINUMA); 1♀, Sakai, Osaka Pref., VI. 1970 (H. TANAKA); 1♀, same locality, 20. VIII. 1970 (H. TANAKA); 13♀♀, 3♂♂, same locality, 10. VII. 1979 (H. TANAKA); Shikoku-1♀, Otsu-cho, Tokushima Pref., 7. VIII. 1959 (T. YAGINUMA); 5♀♀, Kanaiso, Tokushima Pref., 9. VIII. 1957 (T. YAGINUMA); 3♀♀, same locality, 19. IX. 1957 (T. KOBAYASHI); 1♀, Akui-cho, Tokushima Pref., 6. VIII. 1957 (T. YAGINUMA); 1♀, Kochi, Kochi Pref., 22. IX. 1949 (K. NAKAHIRA); 7♀♀, 1♂, Yoshiwara, Kochi Pref., 22. VIII. 1974 (K. NAKAHIRA); Kyushu-1♀, Hikosan, Fukuoka Pref., 11-12. X. 1958 (C. OKUMA); 1♀ (Holotype, SMF-2208), Saga Pref., (W. DÖNITZ); 11♀♀, 2♂♂, Tenzin, Saga Pref., 21. VIII. 1978 (H. TANAKA); 2♀♀, Kinryu, Saga Pref., 21. VIII. 1978 (H. TANAKA); 1♀, Karatsu, Saga Pref., 22. VIII. 1978 (H. TANAKA).



Figs. 5-8. *Pirata subpiraticus* (BÖSENBERG et STRAND). 5. Female epigynum (ventral view). 6. Female epigynum (dorsal view). 7. Male palp (ventral view). 8. Male palp (retrolateral view).

Distribution: Japan (Hokkaido, Honshu, Shikoku and Kyushu), Korea and China.

Biological notes: This spider spins the small and scanty webs in the moist areas of the fields or paddy-fields. Mature females appear from May to September and males from May to July. The formation of egg sac is found from mid-May to August. The number of eggs varies from 60 to 100 in one egg sac.

Remarks: This species is very closely allied to the Holarctic *P. piraticus* (CLERCK). The discriminating characters are noted under the remarks of *piraticus*.

***Pirata clercki* (BÖSENBERG et STRAND, 1906)**

[Japanese name: Kurâku-komorigumo]

(Figs. 9-12)

Tarentula (Pirata) Clercki BÖSENBERG et STRAND, 1906, p. 316, pl. 8, fig. 107, pl. 13, fig. 320.

Pirata clercki: FOX, 1935, p. 456; BONNET, 1958, p. 3657; YAGINUMA, 1960, p. 87, pl. 41, fig. 234; WANG and ZHU, 1963, p. 434; YAGINUMA, 1970, p. 667; TANAKA, 1974, p.

34, pl. 3, figs. 21-24; NAMKUNG, 1976, p. 85; YAGINUMA, 1977, p. 374; SOHN and PAIK, 1981, p. 20; ZHU, 1983, p. 75; PAIK and KIM, 1985, p. 69; YAGINUMA, 1986, p. 167, fig. 92.

Pirata Clercki: SAITO, 1941, p. 121, fig. 138.

Piratula clercki: ROEWER, 1954, p. 287.

Female

Specimen measured: Koyasan, Wakayama Prefecture, 29. VII. 1970 (H. TANAKA).

Measurements (mm). Total length 5.95. Carapace length 3.20, width 2.30. Abdomen length 2.75, width 1.90.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	2.55	3.45	2.15	1.25	9.40
II	2.50	3.00	2.10	1.15	8.75
III	2.35	2.80	2.35	1.05	8.55
IV	3.25	4.20	3.75	1.40	12.60
Palp	1.20	1.35	—	1.00	3.55

Carapace yellowish brown, with dark brown markings and with no lines along margin; V-shaped figure distinct, blackish brown; light yellow lateral bands broad. AER shorter than PMR; AE of equal diameter; AME separated from each other by length being smaller than the diameter of AME, and from ALE by about half the diameter of AME; AER weakly procurved. Clypeus brown, 1.5 times the diameter of AME. Chelicerae reddish brown. Maxillae and labium reddish brown. Sternum yellowish brown, with darker parts along margin. Abdomen blackish grey; a lanceolate median mark distinct; lateral sides yellowish brown, with blackish grey markings; venter yellowish brown, with a few dark brown blotches. Legs reddish brown, with faint annulations on femora I-IV. Palpi reddish brown. Epigynum with a pair of distinct, dark brown, round structures as shown in Fig. 9; three pairs of spermathecae round (Fig. 10).

Male

Specimen measured: Koyasan, Wakayama Prefecture, 29. VII. 1970 (H. TANAKA).

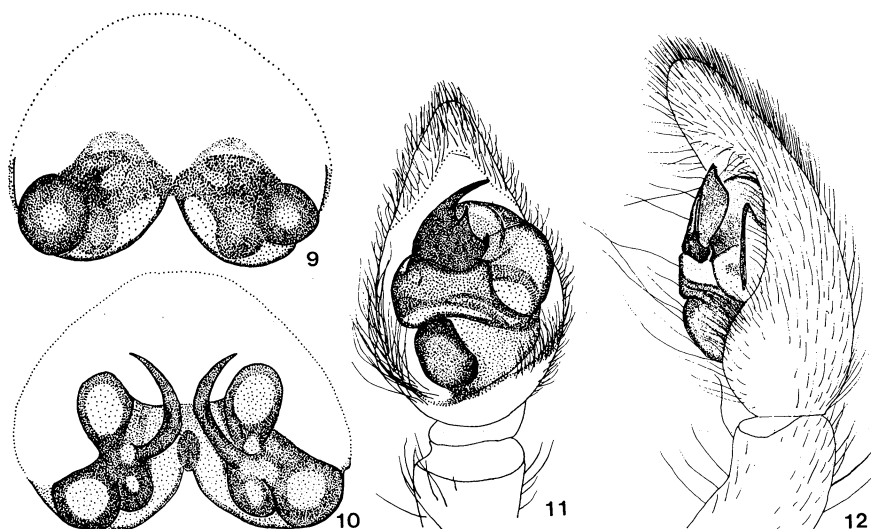
Measurements (mm). Total length 5.10. Carapace length 2.75, width 2.00. Abdomen length 2.35, width 1.50.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	2.30	3.05	2.05	1.40	8.80
II	2.10	2.65	1.90	1.15	7.80
III	2.10	2.40	2.00	0.95	7.45
IV	2.85	3.60	3.25	1.30	11.00
Palp	1.10	1.05	—	0.90	3.05

Similar to the female, but different from it as follows: Palpi; tarsal organs (Fig. 11) with a robust median apophysis bearing long, slender projection upward; median apophysis in retrolateral view sharp at apex, as shown in Fig. 12.

Variation: Total length ♀ 4.45–7.65, ♂ 4.30–5.40. Carapace length ♀ 2.30–3.20, ♂ 2.45–2.85; width ♀ 1.60–2.35, ♂ 1.85–2.10. Abdomen length ♀ 2.15–4.45, ♂ 1.85–2.55; width ♀ 1.25–2.85, ♂ 1.15–1.70. The color varies from reddish brown to blackish grey. The clypeal length ranges 1.0–1.5 times the diameter of AME. Some specimens have distinct annulations on the femora, patellae and tibiae of all the legs.

Material examined: Hokkaido-1♀, Kobuka, Rebun Is., 17. VII. 1971 (H. TANAKA); 1♀, Katsumayama, Okujiri Is., 27. VII. 1964 (M. OHNO); Honshu-1♀, Oshizu-ana Cave, Iwate Pref., 31. VII. 1968 (S. UENO); 1♀, Masuko-cho, Tochigi Pref., 7. VI. 1975 (H. SAITO); 3♀♀, Takayama, Gunma Pref., 30. V. 1984 (T. HAYASHI); 8♀♀, 2♂♂, Hidaka-cho, Saitama Pref., 21. IV. 1973 (H. TANAKA); 1♀, same locality, 30. V. 1981 (Y. FUJII); 1♀, Tama-ku, Kanagawa Pref., 29. IV. 1981 (S. SATO); 1♀, Nakajima-cho, Ishikawa Pref., 8. VIII. 1979 (H. TOKUMOTO); 2♀♀, Oyamaguchi, Hira, Shiga Pref., 5. VIII. 1955 (T. YAGINUMA); 1♂, Echigawa, Shiga Pref., 24. VII. 1979 (T. YAMANO); 1♀, Kitayama, Kyoto Pref., 15. V. 1969 (H. TANAKA); 5♀♀, 1♂, Daimonjiyama, Kyoto Pref., 9. VIII. 1970 (H. TANAKA); 1♀, Osugidani, Mie Pref., 12–14. VI. 1971 (H. TANAKA); 2♀♀, 2♂♂, Yoshino, Nara Pref., 22. VIII. 1971 (H. TANAKA); 2♀♀, 1♂, same locality, 18. VIII. 1981 (H. TANAKA); 15♀♀, 6♂♂, same locality, 4. VIII. 1984 (H. TANAKA); 10♀♀, Iwawakisan, Osaka Pref., 24. VIII. 1970 (H. TANAKA); 1♀, Kimitoge, Osaka Pref., 19. IX. 1971 (H. TANAKA); 10♀♀, 1♂, Inunakiyama, Osaka Pref., 22. VIII. 1970 (H. TANAKA); 2♀♀, 4♂♂, Enmeiji, Osaka Pref., 16. XI. 1970 (H. TANAKA); 1♂, Mino, Osaka Pref., 13. VII. 1981 (H. TANAKA); 16♀♀, 10♂♂, Koyasan, Wakayama Pref., 29. VII. 1970 (H. TANAKA); 1♀, Onuma, Wakayama Pref., 1. VI. 1951 (T. YAGINUMA); 1♀, Otoyama, Wakayama Pref., 22. VII. 1973 (Y. KUWANA); 1♀, Koyasan, Wakayama Pref., 26. VII. 1983 (N. TSURUSAKI);



Figs. 9-12. *Pirata clercki* (BÖSENBERG et STRAND). 9. Female epigynum (ventral view). 10. Female epigynum (dorsal view). 11. Male palp (ventral view). 12. Male palp (retrolateral view).

21♀♀, 14♂♂, Oginosen, Hyogo Pref., 22. VI. 1972 (H. TANAKA); 4♀♀, 1♂, Awagamine, Hyogo Pref., 5. VII. 1970 (H. TANAKA); 1♀, Daisen, Tottori Pref., 17-18. VII. 1970 (F. KOMAI); Shikoku-14♀♀, 11♂♂, Murotomisaki, Kochi Pref., 29. V. 1970 (H. TANAKA); 1♀, Ishizuchiyama, Ehime Pref., 27. VII. 1958 (K. MORIKAWA); 1♀, Matsuyama, Ehime Pref., 19. VI. 1983 (Y. CHIKUNI); Kyushu-3♀♀, Hikosan, Fukuoka Pref., 25. VIII. 1954 (C. OKUMA); 3♀♀, same locality, 4-9. VIII. 1958 (C. OKUMA); 27♀♀, 14♂♂, same locality, 20-24. V. 1971 (H. TANAKA); 3♀♀, same locality, 31. VII. 1982 (N. TSURUSAKI); 2♀♀, 1♂ (Syn-types, SMF-2246), Saga Pref., (W. DÖNITZ); 1♂, Nanatsugama, Simizu-do Cave, Nagasaki Pref., VII. 1951 (M. KUBOTA); 1♀, Sagara-mura, Kumamoto Pref., 5. V. 1973 (T. IRIE); 2♀♀, Amakusa-cho, Kumamoto Pref., 23. VIII. 1973 (T. IRIE); 2♀♀, Kikuchi, Kumamoto Pref., 12. VII. 1978 (T. IRIE); 1♀, Ueki-cho, Kumamoto Pref., 26. VI. 1982 (T. IRIE); 2♀♀, Takachihokyo, Miyazaki Pref., 24. VII. 1960 (C. OKUMA); 1♀, Kirishimayama, Kagoshima Pref., 27. V. 1971 (H. TANAKA); 34♀♀, 1♂, Kirishimakogen, Kagoshima Pref., 27. V. 1971 (H. TANAKA); 38♀♀, 5♂♂, Eboshidake, Kagoshima Pref., 1. VI. 1971 (H. TANAKA); 11♀♀, 4♂♂, Shimadomari, Kagoshima Pref., 29. V. 1971 (H. TANAKA); 13♀♀, 11♂♂, Sadamisaki, Kagoshima Pref., 29. V. 1971 (H. TANAKA); Nansei Isls.-8♀♀,

6♂♂, Anbo, Yakushima Is., Kagoshima Pref., 20. V. 1973 (H. TANAKA); 1♀, Komi, Iriomote Is., Okinawa Pref., 5. XI. 1978 (S. TSUKAGUCHI); 2♀♀, 1♂, same locality, 6. III. 1979 (S. TSUKAGUCHI); 1♀, same locality, 1. V. 1984 (A. TANIKAWA).

Distribution: Japan (Hokkaido, Honshu, Shikoku, Kyushu and Nansei Isls.), Korea and China.

Biological notes: This species spins the small and scanty webs by ponds or rivers. Spiders mature from April to September. The formation of egg sac is found from May to August. The number of eggs in one egg sac varies from 30 to 100.

Remarks: This species is closely related to *P. yaginumai* TANAKA, occurring in Japan, Korea and China; the distinguishing characters are noted in the remarks of the latter species.

***Pirata yaginumai* TANAKA, 1974**

[Japanese name: Nami-komorigumo]

(Figs. 13-16)

Pirata yaginumai TANAKA, 1974, p. 27, pl. 1, figs. 7-10; YAGINUMA, 1977, p. 395; SOHN and PAIK, 1981, p. 23; BRIGNOLI, 1983, p. 457; PAIK and KIM, 1985, p. 69; YAGINUMA, 1986, p. 167, fig. 92.

Female

Specimen measured: Holotype.

Measurements (mm). Total length 6.40. Carapace length 2.40, width 1.85. Abdomen length 4.00, width 2.65.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.90	2.45	1.50	0.90	6.75
II	1.75	2.20	1.45	0.80	6.20
III	1.70	2.05	1.60	0.80	6.15
IV	2.35	2.95	2.50	1.05	8.85
Palp	0.90	0.95	—	0.75	2.60

Carapace yellowish brown, with brown markings and with no lines along margin; V-shaped mark distinct, greyish brown; light yellow lateral bands separated from margins by dark brown bands. AER shorter than PMR; AME larger than ALE; AME separated from each other by about half the diameter of AME, and from ALE by the length being smaller diameter of AME; AER

weakly procurved. Clypeus light brown, equal to the diameter of AME. Chelicerae reddish brown. Maxillae yellowish brown, light yellow at apex. Labium dark brown. Sternum yellowish brown, with dark brown markings along margin. Abdomen yellowish brown, with dark grey markings; a lanceolate median mark distinct; lateral sides greyish brown. Legs reddish brown, with distinct annulations. Palpi uniformly reddish brown. Epigynum (Fig. 13) with a pair of round, hornlike shape; a pair of spermathecae long and slender (Fig. 14).

Male

Specimen measured: One of the paratypes; Oginosen, Hyogo Prefecture, 22. VI. 1972 (H. TANAKA).

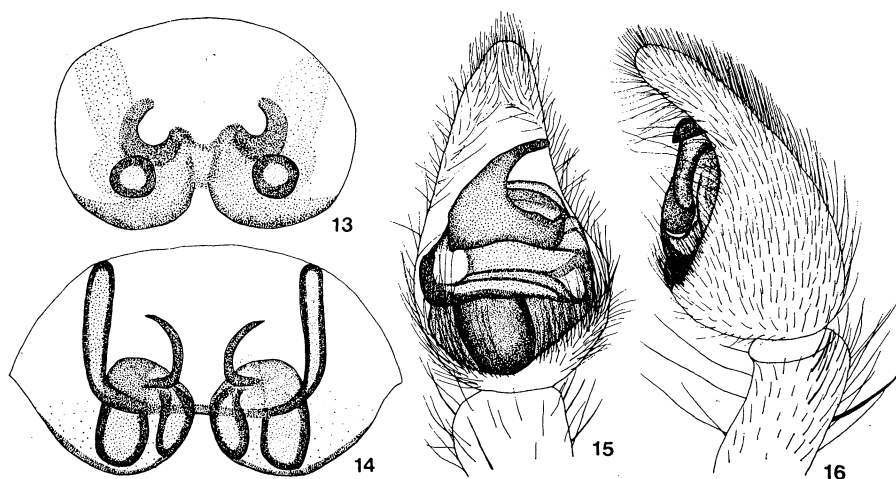
Measurements (mm). Total length 3.80. Carapace length 2.00, width 1.50. Abdomen length 1.80, width 1.15.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.75	2.20	1.55	0.95	6.45
II	1.65	1.95	1.45	0.85	5.90
III	1.60	1.80	1.55	0.75	5.70
IV	2.10	2.70	2.45	1.00	8.25
Palp	0.80	0.65	—	0.85	2.30

Similar to the female, but different from it in the following points: Palpi; tarsal organs (Fig. 15) with robust median apophysis bearing long projection upward; median apophysis, in retrolateral view, wide as illustrated in Fig. 16.

Variation: Total length ♀ 4.65–7.00, ♂ 3.80–4.70. Carapace length ♀ 2.40–3.00, ♂ 2.00–2.50; width ♀ 1.60–2.05, ♂ 1.40–1.90. Abdomen length ♀ 2.25–4.00, ♂ 1.80–2.20; width ♀ 1.25–2.90, ♂ 1.15–1.35.

Material examined: Holotype-1♀, Oginosen, Hyogo Pref., 22. VI. 1972 (H. TANAKA, UOP). Paratypes; Hokkaido-6♀♀, 3♂♂, Sounkyo, 8–9. VII. 1971 (H. TANAKA); 25♀♀, 2♂♂, Aizankei, 10–11. VII. 1971 (H. TANAKA); 30♀♀, 23♂♂, same locality, 17. VII. 1973 (H. TANAKA); 3♀♀, Kamikawa, 10. VII. 1971 (H. TANAKA); 19♀♀, 4♂♂, Yuwaobetsu, 15. VII. 1971 (H. TANAKA); 8♀♀, 5♂♂, Yukomanbetsu, 13. VII. 1973 (H. TANAKA); 1♀, Antaroma, 19. VII. 1973 (H. TANAKA); 1♂, Onumakoen, 11. VII. 1973 (H. TANAKA); Honshu-24♀♀, 2♂♂, Todai, Nagano Pref., 22–23. VII. 1972 (H. TANAKA); 17♀♀, Minotoguchi, Nagano Pref., 31. VII. 1972 (H. TANAKA); 53♀♀, 18♂♂, same locality, 29. VI. 1973 (H. TANAKA); 1♀, 2♂♂, Ozawagawa, Nagano Pref., 2. VI. 1973 (M. HASEGAWA); 9♀♀, 15♂♂, Kibune, Kyoto Pref., 10. V. 1970 (H. TANAKA); 3♀♀,



Figs. 13-16. *Pirata yaginumai* TANAKA. 13. Female epigynum (ventral view). 14. Female epigynum (dorsal view). 15. Male palp (ventral view). 16. Male palp (retrolateral view).

Daihisan, Kyoto Pref., 12. IX. 1970 (H. TANAKA); 3♀♀, 2♂♂, Osugidani, Mie Pref., 12-14. VI. 1971 (H. TANAKA); 12♀♀, 6♂♂, Omimesan, Nara Pref., 7. VI. 1970 (H. TANAKA); 8♀♀, 1♂, Inunakiyama, Osaka Pref., 22. VIII. 1970 (H. TANAKA); 10♀♀, 10♂♂, Iwawakisan, Osaka Pref., 13. V. 1970 (H. TANAKA); 5♀♀, 2♂♂, Koyasan, Wakayama Pref., 29. VII. 1970 (H. TANAKA); 24♀♀, 10♂♂, same data as holotype; 12♀♀, 4♂♂, Mikata, Hyogo Pref., 4. VII. 1970 (H. TANAKA); 17♀♀, 8♂♂, Awagamine, Hyogo Pref., 5. VII. 1970 (H. TANAKA); Kyushu-16♀♀, 30♂♂, Hikosan, Fukuoka Pref., 20-24. V. 1971 (H. TANAKA); 1♀, Kirishimayama, Kagoshima Pref., 27. V. 1971 (H. TANAKA); 13♀♀, 16♂♂, Kirishimajingu, Kagoshima Pref., 27. V. 1971 (H. TANAKA); 16♀♀, 4♂♂, Shimadomari, Kagoshima Pref., 29. V. 1971 (H. TANAKA); 12♀♀, 19♂♂, Kosugidani, Yakushima Is., Kagoshima Pref., 20. V. 1973 (H. TANAKA). Other specimens; Hokkaido-1♀, Nukabira, Tokachi, 2-3. VIII. 1975 (S. TSUKAGUCHI); 1♀, 1♂, Kawato-gun, 24. VI. 1981 (M. MATSUDA); 1♀, 2♂♂, Sapporo, 30. V. 1974 (H. SUWA); Honshu-1♀, Hidaka-cho, Saitama Pref., 7. V. 1981 (Y. FUJII); 2♀, 3♂, Mino, Osaka Pref., 13. VII. 1981 (H. TANAKA).

Distribution: Japan (Hokkaido, Honshu and Kyushu), Korea and China.

Biological notes: This species spins the small and scanty web by ponds or rivers. Spiders mature from May to September and the formation of egg

sacs is found from late in May to August. The number of eggs in one egg sac is approximately 50.

Remarks: This species is allied to *P. piratoides* (BÖSENBERG et STRAND) and *P. clercki* (BÖSENBERG et STRAND), occurring in Japan, Korea, and China. From *piratoides* it can be distinguished by the presence of a very narrow dark brown line along margin on carapace, and from *clercki* by the proportion of the length of AME to that of ALE and by the existence of the light yellow lateral bands separated from the margin on carapace as indicated in the key.

***Pirata piratoides* (BÖSENBERG et STRAND, 1906)**

[Japanese name: Imo-komorigumo]

(Figs. 17-20)

Tarentula (Pirata) piratoides BÖSENBERG et STRAND, 1906, p. 318, pl. 13, fig. 336.

Pirata piratoides: SAITO, 1941, p. 125, fig. 143; BONNET, 1958, p. 3669; TANAKA, 1974, p. 41; YAGINUMA, 1977, p. 395; PAIK, 1979, p. 195, figs. 18-23; TANAKA, 1980, p. 2; SOHN and PAIK, 1981, p. 22; BRIGNOLI, 1983, p. 433; ZHU, 1983, p. 75; PAIK and KIM, 1985, p. 69; YAGINUMA, 1986, p. 167, fig. 92.

Piratula piratoides: ROEWER, 1954, p. 288.

Pirata japonicus TANAKA, 1974, p. 29, pl. 2, figs. 11-14; YAGINUMA, 1977, p. 395; WANG, 1981, p. 121, fig. 61.

Female

Specimen measured: Kamiakuigawa, Tokushima Prefecture, Shikoku, 30. V. 1970 (H. TANAKA).

Measurements (mm). Total length 5.10. Carapace length 2.50, width 1.75. Abdomen length 2.60, width 1.85.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.80	2.10	1.35	0.80	6.05
II	1.65	1.95	1.25	0.80	5.65
III	1.60	1.80	1.35	0.70	5.45
IV	2.15	2.70	2.35	0.95	8.15
Palp	0.80	0.85	—	0.65	2.30

Carapace yellowish brown, with brown markings and a very narrow dark brown line along margin; V-shaped mark distinct, brown; light yellow lateral bands separated from margins by dark brown bands. AER shorter than PMR; diameter of ALE about half as large as that of AME; AME separated from each other by about half the diameter of AME, and from ALE by length being

smaller than half the diameter of AME; AER weakly procurved. Clypeus yellowish brown, shorter than half the diameter of AME. Chelicerae reddish brown. Maxillae yellowish brown, and light yellow at apex. Labium greyish brown. Sternum yellowish brown, with faint black patches opposite first three pairs of coxae. Abdomen yellowish brown, with blackish grey markings; a lanceolate median mark distinct; lateral and ventral sides greyish brown, with blackish grey markings. Legs and palpi unicolorous, reddish brown. Epigynum with paired dark, forked structures (Fig. 17); spermathecae long, erect (Fig. 18).

Male

Specimen measured: Kamiakuigawa, Tokushima Prefecture, Shikoku, 30. V. 1970 (H. TANAKA).

Measurements (mm). Total length 4.55. Carapace length 2.25, width 1.65. Abdomen length 2.30, width 1.50.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.70	2.05	1.40	0.80	5.95
II	1.55	1.85	1.30	0.75	5.45
III	1.50	1.65	1.40	0.65	5.20
IV	2.00	2.45	2.20	0.90	7.55
Palp	0.80	0.75	—	0.65	2.20

Different from the female as follows: Legs yellowish brown on femora and patellae I-IV; tarsus I viewed from above clearly incurved. Palpi; tarsal organs (Fig. 19) with robust median apophysis having long projection at apex; median apophysis in retrolateral view wide at the upper part, and with one projection tapered at end on ventral margin as shown in Fig. 20.

Variation: Total length ♀ 3.95-6.35, ♂ 3.95-4.70. Carapace length ♀ 2.10-2.75, ♂ 2.05-2.40; width ♀ 1.45-1.95, ♂ 1.40-1.75. Abdomen length ♀ 1.85-3.60, ♂ 1.90-2.30; width ♀ 1.20-2.50, ♂ 1.15-1.50. In some individuals, there are faint annulations on all the legs.

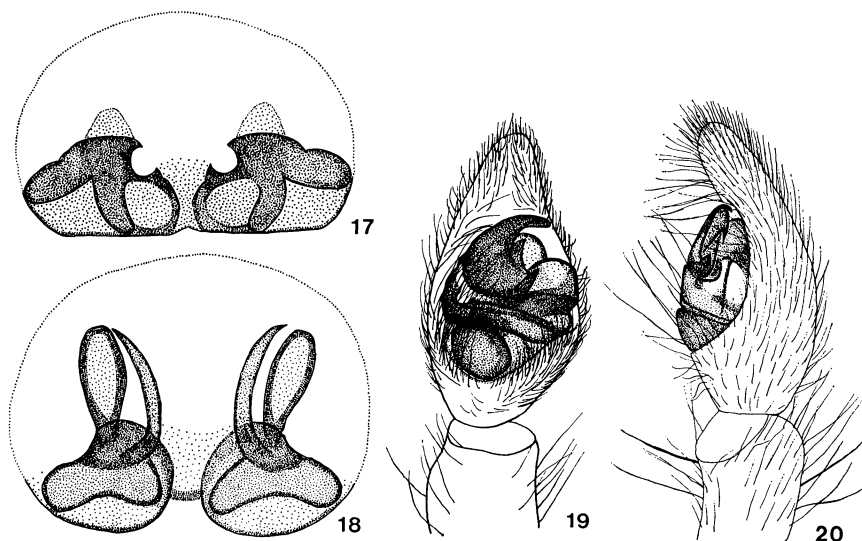
Material examined: Hokkaido—1♀, 1♂, Momoiwa, Rebun Is., 17. VII. 1971 (H. TANAKA); 1♀, Aizankei, 10-11. VII. 1971 (H. TANAKA); 4♀♀, same locality, 17. VII. 1973 (H. TANAKA); 4♀♀, 3♂♂, Yukomanbetsu, 13. VII. 1973 (H. TANAKA); 16♀♀, 13♂♂, Antaroma, 19. VII. 1973 (H. TANAKA); 4♀♀, Nukabira, Tokachi, 2-3. VIII. 1975 (S. TSUKAGUCHI); 26♀♀, 19♂♂, Kamikawa, 10. VII. 1971 (H. TANAKA); 27♀♀, 13♂♂, Sapporo, 23. VII. 1971 (H. TANAKA); 2♀♀, Oiwake-cho, 20. VIII. 1983 (F. KOMAI); 35♀♀, 9♂♂, Onumakoen, 24. VII. 1971 (H.

TANAKA); 18♀♀, 11♂♂, same locality, 11. VII. 1973 (H. TANAKA); Honshu—1♀, Hata-cho, Aomori Pref., 18. VII. 1978 (H. YOSHIDA); 2♀♀, 2♂♂, Niida, Akita Pref., VI–VII. 1970 (S. KOYAMA); 2♀♀, Kuriyamagawa, Iwate Pref., 3. VII. 1964 (T. OKU); 1♀, Takizawa, Iwate Pref., 25. VI. 1973 (F. KOMAI); 3♀♀, 1♂, Sendai, Miyagi Pref., IV–XI. 1972 (S. KOBAYASHI); 2♀♀, 1♂, same locality, 25. VII. 1981 (K. SASAKI); 3♀♀, 1♂, Zao, Yamagata Pref., 15. VII. 1984 (H. YOSHIDA); 4♀♀, Ogura, Yamagata Pref., 28. VII. 1984 (H. YOSHIDA); 1♀, 3♂♂, Numata, Gunma Pref., 23. VI. 1984 (H. TANAKA); 11♀♀, 9♂♂, Ina, Nagano Pref., 7–8. VII. 1972 (H. TANAKA); 3♀♀, Togakushi-kogen, Nagano Pref., 16. VII. 1975 (K. UEDA); 1♀, Abiko-cho, Chiba Pref., 12. VIII. 1969 (S. MATSUMOTO); 4♀♀, Hidaka-cho, Saitama Pref., 1972 (Y. FUJII); 1♀, 1♂, same locality, V–VII. 1981 (Y. FUJII); 1♀, Hozoji, Saitama Pref., 13. VIII. 1979 (K. SUZUKI); 1♀, Niijima, Tokyo, 3–5. V. 1955 (T. AOKI); 4♀♀, Atugi, Kanagawa Pref., 21–29. VII. 1979 (K. SUZUKI); 1♀, Taihizan, Kyoto Pref., 12. IX. 1970 (H. TANAKA); 1♀, Yodogawa, Osaka Pref., 26. VII. 1958 (M. YOSHIDA); 1♀, Sumiyoshi, Osaka Pref., 30. VIII. 1965 (Y. TARUMI); 4♀♀, Mikata, Hyogo Pref., 24. III. 1969 (H. TANAKA); 1♀, Sanyo-cho, Okayama Pref., 24. VI. 1976 (T. MAEDA); 1♀, Naga-tokyo, Yamaguchi Pref., 12. VII. 1965 (K. MURAI); Shikoku—1♀ (Holotype of *japonicus*, UOP), Kamiakuigawa, Tokushima Pref., 30. V. 1970 (H. TANAKA); 15♀♀ & 8♂♂ (Paratypes of *japonicus*), same data as holotype; 2♀♀, Akui-cho, Tokushima Pref., 31. VIII. 1956 (T. KOBAYASHI); 2♀♀, same locality, 6. VIII. 1957 (T. KOBAYASHI); 1♀, Ishii, Tokushima Pref., 8. VIII. 1957 (T. YAGINUMA); 1♀, Komatsujima, Tokushima Pref., 9. VIII. 1957 (T. YAGINUMA); 14♀♀, 5♂♂, Tarumi, Ehime Pref., 25. V. 1970 (H. TANAKA); Kyushu—14♀♀, 4♂♂, Fukuoka, Fukuoka Pref., 18. V. 1971 (H. TANAKA); 1♀ (Holotype of *piratoides*, SMF-2204), Saga Pref., (W. DÖNITZ); 13♀♀, 2♂♂, Kinryu, Saga Pref., 21. VIII. 1978 (H. TANAKA); 11♀♀, Tenjin, Saga Pref., 21. VIII. 1978 (H. TANAKA); 37♀♀, 10♂♂, Mizumoto, Saga Pref., 22. VIII. 1978 (H. TANAKA); 12♀♀, 4♂♂, Kagoshima, Kagoshima Pref., 25. V. 1971 (H. TANAKA).

Distribution: Japan (Hokkaido, Honshu, Shikoku and Kyushu), Korea, and China.

Biological notes: This spider lives in the crevices or depressions of the wet areas in the fields or paddy-fields. Mature females are found from April to September and males from April to August. The formation of egg sac is found from May to August. The mean number of eggs is 50 in one egg sac.

Remarks: This species is similar to *P. yaginumai* TANAKA and *P. clercki*



Figs. 17-20. *Pirata piratoides* (BÖSENBERG et STRAND). 17. Female epigynum (ventral view). 18. Female epigynum (dorsal view). 19. Male palp (ventral view). 20. Male palp (retrolateral view).

(BÖSENBERG et STRAND), occurring in Japan, Korea, and China. The discriminating characters are mentioned under the remarks of *yaginumai*.

***Pirata meridionalis* TANAKA, 1974**

[Japanese name: Minami-komorigumo]

(Figs. 21-24)

Pirata meridionalis TANAKA, 1974, p. 31, pl. 2, figs. 15-17; YAGINUMA, 1977, p. 395; SOHN and PAIK, 1981, p. 20, figs. 1-10; BRIGNOLI, 1983, p. 456; PAIK and KIM, 1985, p. 69; YAGINUMA, 1986, p. 169.

Female

Specimen measured: Holotype.

Measurements (mm). Total length 5.55. Carapace length 2.75, width 2.05. Abdomen length 2.80, width 2.05.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	2.15	2.70	1.75	1.00	7.60
II	2.00	2.35	1.65	0.90	6.90
III	1.95	2.15	1.75	0.85	6.70
IV	2.55	3.15	2.80	1.15	9.65
Palp	0.95	1.10	—	0.85	2.90

Carapace yellowish brown, with dark brown markings and a very narrow dark brown line along margin; V-shaped mark distinct, blackish brown; light yellow lateral bands separated from margins by dark brown bands. AER shorter than PMR; AME slightly larger than ALE; AME separated from each other by about half the diameter of AME, and from ALE by length being smaller than half the diameter of AME; AER weakly procurved. Clypeus yellowish brown, as high as the diameter of AME. Chelicerae reddish brown. Maxillae yellowish brown. Labium dark yellowish brown. Sternum yellowish brown, with dark brown parts along margin. Abdomen blackish grey, with three pairs of white spots; a lanceolate median mark distinct; lateral sides greyish brown, having white and black pubescence, with blackish grey markings; venter greyish brown. Legs greyish brown, with no annulation; vertical straight hairs on tibiae, metatarsi and tarsi of all legs. Palpi greyish brown. Epigynum with paired black oval structures at lower part and indistinct longitudinal spermathecae which are seen through the body wall (Fig. 21); a pair of spermathecae long, as in Fig. 22.

Male

Specimen measured: One of the paratypes.

Measurements (mm). Total length 4.35. Carapace length 2.55, width 1.80. Abdomen length 1.80, width 1.15.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.95	2.30	1.75	1.00	7.00
II	1.75	2.05	1.55	0.85	6.20
III	1.65	1.95	1.60	0.75	5.95
IV	2.25	2.90	2.50	1.00	8.65
Palp	0.80	0.90	—	0.75	2.45

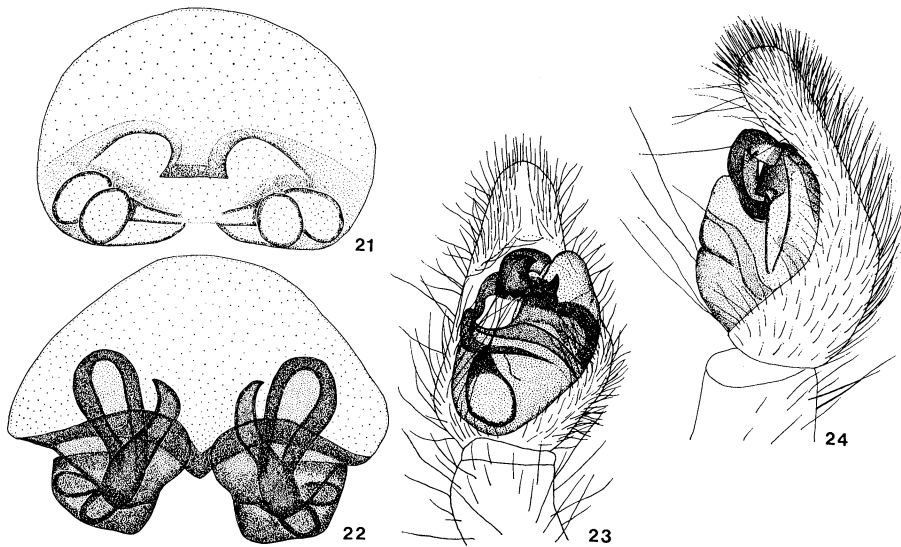
Similar to the female, but different from it in the following features: AER procurved. Legs; many vertical straight hairs curled at tip on prolateral sides of metatarsi II, and vertical straight hairs on another metatarsi. Palpi; tarsal organs (Figs. 23-24) with robust median apophysis bearing one small projection on dorsal surface.

Variation: Total length ♀ 4.85-5.65, ♂ 3.75-4.50. Carapace length ♀ 2.40-2.80, ♂ 2.20-2.60; width ♀ 1.75-2.10, ♂ 1.50-1.80. Abdomen length ♀ 2.45-2.85, ♂ 1.55-1.90; width ♀ 1.20-2.05, ♂ 0.95-1.20. In some individuals, a very narrow dark brown line along the margin on the carapace is faint or absent.

Material examined: Honshu- 1♀, Hozoji, Saitama Pref., 13. VIII. 1979 (K. SUZUKI); 17♀♀, 9♂♂, Midoroga-ike, Kita-ku, Kyoto Pref., 18. VII. 1980 (H. TANAKA); 3♀♀, 3♂♂, same locality, 28. VI.-5. VII. 1982 (T. KAMURA); 17♀♀, 15♂♂, Mozu-umemachi, Osaka Pref., 10. VII. 1979 (H. TANAKA); 6♀♀, 1♂, same locality, 28. VII. 1980 (H. TANAKA); 23♀♀, 21♂♂, Honjo-cho, Shimane Pref., 15. VI. 1977 (T. YAMANO); Shikoku- 9♀♀, 1♂, Yoshihara, Kochi Pref., 22. VIII. 1974 (K. NAKAHIRA); 30♀♀, 20♂♂, same locality, 4. VIII. 1975 (K. NAKAHIRA); Kyushu- 3♀♀, 1♂, Tenjin, Saga Pref., 21. VIII. 1978 (H. TANAKA); Nansei Isls.- 1♀ (Holotype, UOP), Miyanoura, Yakushima Is., Kagoshima Pref., 18. V. 1973 (H. TANAKA); 5♀♀ & 9♂♂ (Paratypes), same data as holotype.

Distribution: Japan (Honshu, Shikoku and Kyushu), and Korea.

Biological notes: This spider lives in the small and scanty web by the



Figs. 21-24. *Pirata meridionalis* TANAKA. 21. Female epigynum (ventral view). 22. Female epigynum (dorsal view). 23. Male palp (ventral view). 24. Male palp (retrolateral view).

ponds or in paddy-fields. Spiders mature from May to September and the formation of egg sac is found in June and July. The number of eggs in one egg sac is 50 on the average.

Remarks: This species is similar to *P. boreus* TANAKA from Japan, but is easily distinguished from the latter by the presence of the very narrow dark brown line along the margin on the carapace, and by the presence of the vertical straight hairs on tibiae, metatarsi and tarsi of female legs I-IV.

***Pirata boreus* TANAKA, 1974**

[Japanese name: Hate-komorigumo]

(Figs. 25-28)

Pirata boreus TANAKA, 1974, p. 33, pl. 2, figs. 18-20; YAGINUMA, 1977, p. 394; BRIGNOLI, 1983, p. 456; YAGINUMA, 1986, p. 169.

Female

Specimen measured: Holotype.

Measurements (mm). Total length 4.10. Carapace length 2.05, width 1.50. Abdomen length 2.05, width 1.45.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.60	1.95	1.30	0.75	5.60
II	1.50	1.80	1.20	0.70	5.20
III	1.45	1.70	1.35	0.65	5.15
IV	2.10	2.55	2.30	0.90	7.85
Palp	0.75	0.85	—	0.60	2.20

Carapace yellowish brown, with dark brown markings and without line along margin, V-shaped mark distinct, dark brown; light yellow lateral bands separated from margins by dark bands. AER shorter than PMR; AME larger than ALE; AME separated from each other by about half the diameter of AME, and from ALE by length being smaller than half the diameter of AME; AER procurved. Clypeus dark brown, as high as the diameter of AME. Chelicerae and maxillae dark yellowish brown. Labium dark brown. Sternum yellowish brown, with dark brown markings along margin. Abdomen blackish grey, with four pairs of white spots (groups of pubescence); a lanceolate median mark distinct; lateral sides greyish brown, with blackish grey markings; ventral sides greyish brown. Legs and palpi unicolored greyish brown. Epigynum with two round structures

in a pair of egglike spermathecae at basal part, and paired large, round spermathecae which are seen through the body wall at apical part (Fig. 25); a pair of large circular spermathecae present (Fig. 26).

Male

Specimen measured: One of the paratypes.

Measurements (mm). Total length 3.55. Carapace length 1.90, width 1.45. Abdomen length 1.65, width 1.00.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.55	1.85	1.50	0.90	5.80
II	1.45	1.65	1.25	0.75	5.10
III	1.35	1.50	1.30	0.65	4.80
IV	1.90	2.30	2.15	0.85	7.20
Palp	0.65	0.70	—	0.65	2.00

Differences from the female are as follows: Legs; many vertical straight hairs curled at tip on prolateral sides of metatarsi II. Palpi; tarsal organs (Figs. 27-28) with robust median apophysis strongly curved at apex and wide at end.

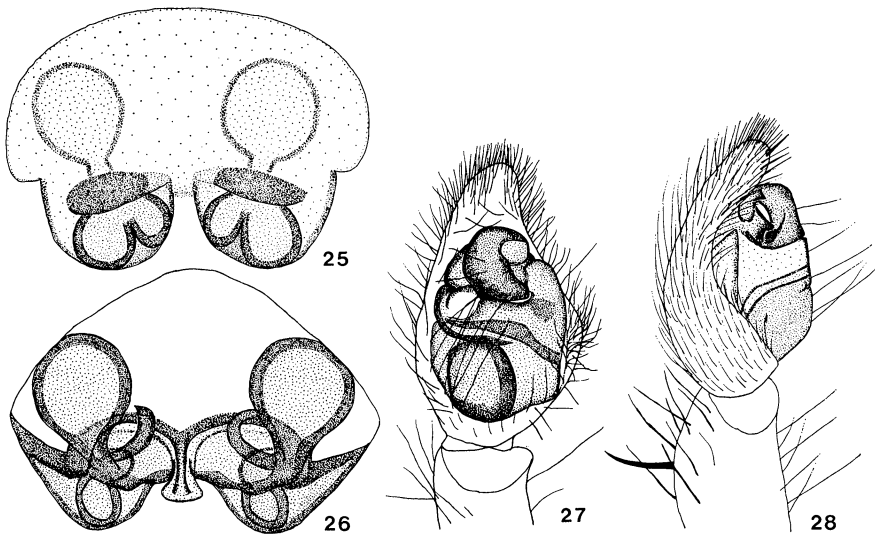
Variation: Because only a single male has been obtained, the measurements are based on the females. Total length 3.85-5.35. Carapace length 2.05-2.65, width 1.45-1.85. Abdomen length 1.80-2.70, width 1.10-1.90. The color varies from reddish brown to greyish brown.

Material examined: Hokkaido- 2♀♀ (Paratypes), Onumakoen, 24. VII. 1971 (H. TANAKA); 1♀ (Holotype, UOP), same locality, 11. VII. 1973 (H. TANAKA); 5♀♀ & 1♂ (Paratypes), same data as holotype.

Distribution: Japan (Hokkaido).

Biological notes: This species is found at the shores of the ponds. Mature spiders appear in July. The form of the egg sac, and the period of its formation have not been unknown.

Remarks: This species is similar to *P. tanakai* BRIGNOLI from Japan, *P. procurvus* (BÖSENBERG et STRAND) from Japan, Korea and China, and *P. latitans* (BLACKWALL) from Europe in the shape of the epigynum, but is distinguished from them in the following points:



Figs. 25-28. *Pirata boreus* TANAKA. 25. Female epigynum (ventral view). 26. Female epigynum (dorsal view). 27. Male palp (ventral view). 28. Male palp (prolateral view).

	<i>boreus</i>	<i>tanakai</i>	<i>procurvus</i>	<i>latitans</i>
Light lateral bands on carapace separated from markings by dark bands	present	present	absent	absent
Ratio of AME to ALE	more than 1	1	1	1
AER	procurved	procurved	procurved	straight

Pirata procurvus (BÖSENBERG et STRAND, 1906)

[Japanese name: Chibi-komorigumo]

(Figs. 29-32)

Tarentula (Pirata) procurva BÖSENBERG et STRAND, 1906, p. 315, pl. 13, fig. 321.

Pirata procurva: SAITO, 1941, p. 125, fig. 144; YAGINUMA, 1960, p. 87, pl. 41, fig. 232;

—, 1961, p. 83.

Piratula procurva: ROEWER, 1954, p. 288.

Pirata procurvus: BONNET, 1958, p. 3671; YAGINUMA, 1970, p. 667; TANAKA, 1974, p. 38, pl. 3, figs. 28-31; NAMKUNG, 1976, p. 85; YAGINUMA, 1977, p. 395; SOHN and PAIK, 1981, p. 22; ZHU, 1983, p. 75; PAIK and KIM, 1985, p. 69; YAGINUMA, 1986, p. 167, fig. 92.

Tarentula sagaphila STRAND, 1916, p. 99, *n. syn.*

Lycosa sagaphila: YAGINUMA, 1970, p. 666; —, 1977, p. 393.

Female

Specimen measured: Ina, Nagano Prefecture, 28. VI. 1973 (H. TANAKA).

Measurements (mm). Total length 4.45. Carapace length 2.05, width 1.40. Abdomen length 2.40, width 1.55.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.55	1.95	1.15	0.80	5.45
II	1.40	1.75	1.10	0.70	4.95
III	1.45	1.55	1.30	0.65	4.95
IV	2.00	2.50	2.25	0.95	7.70
Palp	0.70	0.70	—	0.65	2.05

Carapace yellowish brown, with dark brown markings and a very narrow dark brown line along margin; V-shaped mark distinct, dark brown; light yellow lateral band broad. AER shorter than PMR; AME equal in length to ALE; AME separated from each other and ALE by about the diameter of AME; AER procurved. Clypeus brown, equal to the diameter of AME. Chelicerae reddish brown. Maxillae yellowish brown. Labium dark reddish brown. Sternum greyish brown, with faint dark brown markings along margin. Abdomen blackish grey; a lanceolate median mark faint along margin; lateral sides yellowish brown, with blackish grey markings; venter greyish yellow. Legs uniformly reddish brown. Palpi dark reddish brown. Epigynum with three pairs of indistinct round structures (Fig. 29); a pair of small round spermathecae present at apical part as in Fig. 30.

Male

Specimen measured: Ina, Nagano Prefecture, 28. VI. 1973 (H. TANAKA).

Measurements (mm). Total length 3.60. Carapace length 2.00, width 1.35. Abdomen length 1.60, width 1.05.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.35	1.75	1.15	0.80	5.05
II	1.40	1.60	1.10	0.70	4.80
III	1.25	1.45	1.20	0.60	4.50
IV	1.80	2.20	1.95	0.85	6.80
Palp	0.75	0.65	—	0.70	2.10

Carapace greyish brown, with dark brown markings and a very narrow dark brown line along margin; V-shaped mark indistinct light yellow lateral bands. AER strongly procurved. Clypeus blackish grey, 1.5 times the diameter of AME. Chelicerae blackish grey. Maxillae yellowish brown. Labium greyish brown.

Sternum yellowish white. Abdomen blackish grey, a lanceolate median mark distinct; lateral sides greyish brown, with blackish grey markings; venter greyish yellow. Legs black on femora I, and yellowish white on patellae to tarsi I; greyish brown on the other legs II-IV. Palpi black on femora, and blackish yellow on patellae and tibiae; tarsal organs (Figs. 31-32) with robust coiled median apophysis tapering to apex.

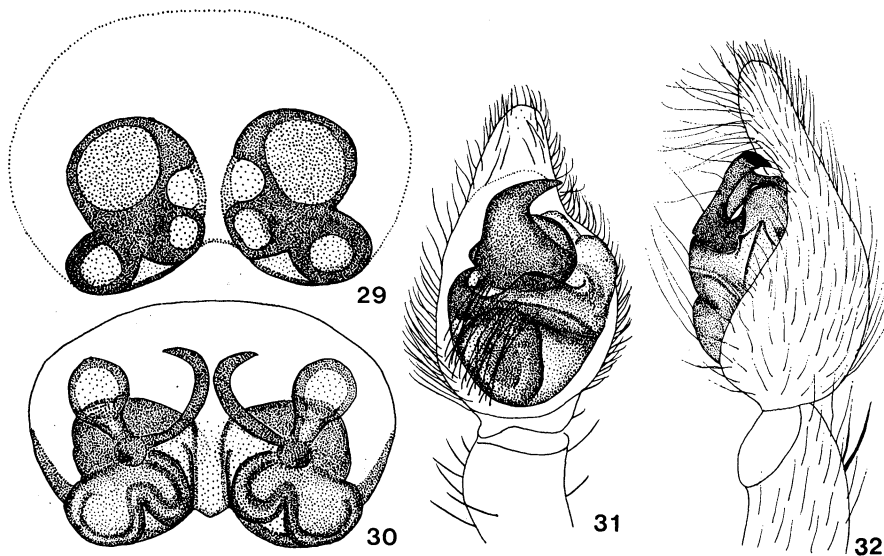
Variation: Total length ♀ 3.10-4.80, ♂ 3.00-3.95. Carapace length ♀ 1.60-2.20, ♂ 1.70-2.05; width ♀ 1.10-1.60, ♂ 1.00-1.45. Abdomen length ♀ 1.50-2.60, ♂ 1.30-1.90; width ♀ 1.00-1.80, ♂ 0.85-1.25. The color varies from reddish brown to blackish grey. In both the sexes, the clypeal length ranges 1.0-1.5 times the diameter of AME. The diameter of AME is smaller than that of ALE in some samples. In some males, the lanceolate median mark is faint or absent.

Material examined: Hokkaido- 1♀, Sounkyo, 20. VII. 1980 (N. YASHIRO); Honshu- 1♀, Matsuda-cho, Tochigi Pref., 29. VII. 1979 (H. SAITO); 1♀, Kusatsu, Gunma Pref., 14.VIII. 1979 (A. TANIKAWA); 1♂, Kuwahara, Gunma Pref., 1. VII. 1984 (T. HAYASHI); 19♀♀, 6♂♂, Ina, Nagano Pref., 8. VII. 1972 (H. TANAKA); 5♀♀, same locality, 21. VII. 1972 (H. TANAKA); 22♀♀, 20♂♂, same locality, 28. VI. 1973 (H. TANAKA); 2♀♀, Hozoji, Saitama Pref., 13. VIII. 1979 (K. SUZUKI); 1♂, Miyakejima, Tokyo, 5. VIII. 1978 (K. SUZUKI); 2♀♀, Atsugi, Kanagawa Pref., 21-29. VII. 1979 (K. SUZUKI); 1♀, Noniwa-cho, Kanagawa Pref., 12. VII. 1980 (A. TANIKAWA); 1♀, 1♂, Tatsunokuchi-machi, Ishikawa Pref., 20. VI. 1982 (H. TOKUMOTO); 1♀, Omijinja, Shiga Pref., 28. V. 1965 (Y. TARUMI); 3♀♀, 3♂♂, Sakyo-ku, Kyoto Pref., 26. VII. 1976 (A. NISHIMURA); 11♀♀, 3♂♂, Yoshino, Nara Pref., 22. VIII. 1971 (H. TANAKA); 5♀♀, same locality, 5. VIII. 1984 (H. TANAKA); 1♀, Shirasagi, Osaka Pref., 12. VI. 1964 (Y. TARUMI); 1♀, Kimitoge, Osaka Pref., 17. IX. 1971 (H. TANAKA); 10♀♀, 1♂, Iwawakisan, Osaka Pref., 24. VIII. 1970 (H. TANAKA); 6♀♀, 6♂♂, Sakai, Osaka Pref., 1. VII. 1970 (H. TANAKA); 1♂, Amami, Osaka Pref., 27. V. 1969 (H. TANAKA); 1♀, Nachiotaki, Wakayama Pref., 28. VII. 1983 (N. TSURUSAKI); 3♀♀, 5♂♂, Awagamine, Hyogo Pref., 5. VII. 1970 (H. TANAKA); 1♀, 4♂♂, Oginosen, Hyogo Pref., 22. VI. 1972 (H. TANAKA); 4♀♀, 4♂♂, Sanyo-cho, Okayama Pref., 1. VI. 1976 (T. MAEDA); Shikoku- 1♀, Okubodera, Kagawa Pref., 5. VIII. 1968 (Y. TARUMI); 2♂♂, Tarumi, Ehime Pref., 25. V. 1970 (H. TANAKA); 3♀♀, Omogo, Ehime Pref., 20. VII. 1958 (K. MORIKAWA); Kyushu- 4♀♀, Hikosan, Fukuoka Pref., 25. VIII. 1954 (C. OKUMA); 2♀♀, 2♂♂, same locality, 4-9. VIII. 1958 (C. OKUMA);

3♀ ♀, Chikushi-yabakei, Fukuoka Pref., 21. VII. 1959 (S. MIYAMOTO); 1♀, 2♂ ♂, Nanakuma, Fukuoka Pref., 13. VI. 1958 (C. OKUMA); 1♂, Hikosan, Fukuoka Pref., 30. VII. 1982 (N. TSURUSAKI); 1♀ & 1♂ (Syntypus of *procurvus*, SMF-2217), Saga Pref., (W. DÖNITZ); 7♀ ♀, 1♂, Izuhara, Tsushima Is., Nagasaki Pref., 26. VII. 1982 (N. TSURUSAKI); 1♀, Miyazakijingu, Miyazaki Pref., 14. VI. 1953 (T. YAGINUMA); 1♀, Aoshima, Miyazaki Pref., 14. VI. 1953 (T. YAGINUMA); 1♀, Shuba, Miyazaki Pref., 6-7. VIII. 1961 (C. OKUMA); 1♀, Takachiho-kyo, Miyazaki Pref., 1. VIII. 1982 (N. TSURUSAKI); 9♀ ♀, 6♂ ♂, Eboshidake, Kagoshima Pref., 1. VI. 1971 (H. TANAKA); 2♀ ♀, 1♂, Sadamisaki, Kagoshima Pref., 29. V. 1971 (H. TANAKA); 13♀ ♀, 16♂ ♂, Shimadomari, Kagoshima Pref., 29. V. 1971 (H. TANAKA); Nansei Isls.- 26♀ ♀, 18♂ ♂, Anbo, Yakushima Is., Kagoshima Pref., 25. V. 1973 (H. TANAKA); 1♀, Yuwan, Amamioshima Is., Kagoshima Pref., 29. VII. 1964 (Y. TARUMI).

Distribution: Japan (Hokkaido, Honshu, Shikoku, Kyushu and Nansei Isls.), Korea and China.

Biological notes: This spider lives at the moisture areas covered with fallen leaves of fields. Mature spiders are found from May to September and the



Figs. 29-32. *Pirata procurvus* (BÖSENBERG et STRAND). 29. Female epigynum (ventral view). 30. Female epigynum (dorsal view). 31. Male palp (ventral view). 32. Male palp (retrolateral view).

formation of egg sac is found in July and August. The number of eggs in one egg sac is 20 on the average.

Remarks: This species is similar to the Japanese *P. boreus* TANAKA, the Japanese *P. tanakai* BRIGNOLI, and the European *P. latitans* (BLACKWALL). The distinguishable characters are noted in the remarks of *boreus*.

The type-specimen of *Tarentula sagaphila* STRAND from Japan was probably lost. Judging from the original description of this species, I treat here it as junior synonym of *procurvus*.

***Pirata tanakai* BRIGNOLI, 1983**

[Japanese name: Kogata-komorigumo]

(Figs. 33-36)

Pirata exiguus TANAKA, 1974, p. 37, pl. 3, figs. 25-27; YAGINUMA, 1977, p. 395.

Pirata tanakai BRIGNOLI, 1983, p. 456; YAGINUMA, 1986, p. 169.

Female

Specimen measured: Holotype.

Measurements (mm). Total length 3.65. Carapace length 1.95, width 1.40. Abdomen length 1.70, width 1.20.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.40	1.70	1.05	0.65	4.80
II	1.30	1.55	1.00	0.60	4.45
III	1.25	1.50	1.15	0.60	4.50
IV	1.75	2.25	1.95	0.85	6.80
Palp	0.70	0.75	—	0.55	2.00

Carapace yellowish brown, with dark brown markings and a very narrow dark brown line along margin; V-shaped mark distinct, greyish brown; light yellow lateral bands separated from margins by dark brown bands. AER shorter than PMR; AER equal diameter; AME separated from each other and from ALE by about half the diameter of AME; AER procurved. Clypeus brown, as high as the diameter of AME. Chelicerae reddish brown. Maxillae yellowish brown. Labium greyish brown. Sternum yellowish brown, with indistinct greyish markings along margin. Abdomen blackish grey, with greyish brown patches; a lanceolate median mark faint; lateral sides greyish brown, with blackish grey markings; venter greyish brown. Legs greyish brown, with no annulation. Palpi yellowish brown from femora to tarsi. Epigynum with a pair of round,

oval structures at basal part and large round spermathecae at apical part are seen through the body wall (Fig. 33); a pair of small oval spermathecae and large ones present as in Fig. 34.

Male

Specimen measured: One of the paratypes; Minotoguchi, Nagano Prefecture, 29. VI. 1973 (H. TANAKA).

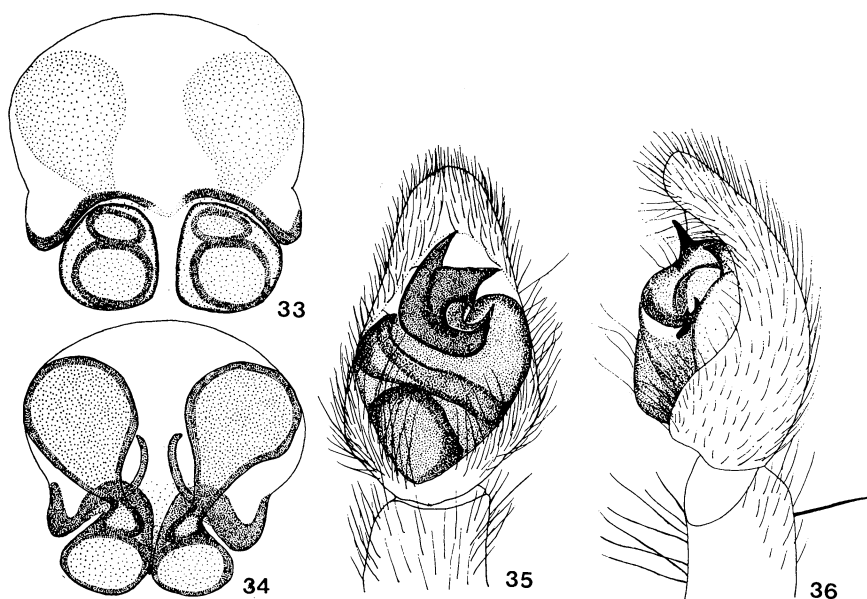
Measurements (mm). Total length 3.30. Carapace length 1.85, width 1.30. Abdomen length 1.45, width 1.00.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.30	1.55	1.00	0.70	4.55
II	1.25	1.45	1.00	0.65	4.35
III	1.25	1.40	1.10	0.60	4.35
IV	1.65	2.10	1.80	0.85	6.40
Palp	0.75	0.65	—	0.60	2.00

Carapace greyish brown, with dark brown markings and a very narrow dark brown line along margin; V-shaped mark distinct, dark brown; light yellow lateral bands separated from margins by dark brown bands. Eyes same as the female, except for extremely procurved AER. Clypeus blackish grey, equal to the diameter of AME. Chelicerae blackish grey. Maxillae greyish brown on base, light yellow at apex. Labium blackish grey. Sternum greyish yellow, with dark brown markings along margin. Abdomen blackish grey; a lanceolate median mark distinct; lateral sides greyish yellow, with blackish grey markings; venter greyish yellow. Legs black on femora I–II, and yellowish white on patellae to tarsi I–II; greyish brown on femora III–IV, and yellowish brown on patellae to tarsi III–IV. Palpi black on femora, and blackish yellow on patellae and tibiae; tarsal organs (Figs. 35–36) with forked median apophysis.

Variation: Total length ♀ 3.25–4.90, ♂ 3.20–3.55. Carapace length ♀ 1.70–2.20; ♂ 1.75–2.00; width ♀ 1.30–1.50, ♂ 1.20–1.40. Abdomen length ♀ 1.55–2.70, ♂ 1.45–1.55; width ♀ 1.10–2.00, ♂ 1.00–1.10. In some samples of the females, the lanceolate median mark distinct. The color pattern is very similar in all specimens.

Material examined: Hokkaido- 4♀♀ (Paratypes), Kushiro, 10. VIII. 1964 (M. TSUTSUMI); 2♀♀, Oiwake-cho, 23. VIII. 1983 (F. KOMAI); 2♀♀, 7♂♂, Tomakomai, 15. VII. 1983 (N. TSURUSAKI); Honshu- 1♂, Nikko, Tochigi Pref., 10. VII. 1976 (H. SAITO); 1♀, Sakura-mura, Ibaragi Pref., 24. VII. 1976 (A. TANIKAWA); 1♀, Marunuma, Gunma Pref., 24. VI. 1984 (H. TANAKA); 1♀ (Holotype, UOP), Mino-



Figs. 33-36. *Pirata tanakai* BRIGNOLI. 33. Female epigynum (ventral view). 34. Female epigynum (dorsal view). 35. Male palp (ventral view). 36. Male palp (retrolateral view).

toguchi, Nagano Pref., 31. VII. 1972 (H. TANAKA); 13 ♀♀ (Paratypes), same data as holotype; 8 ♀♀ & 5 ♂♂ (Paratypes), same locality, 29. VI. 1973 (H. TANAKA); 1 ♀, Yahatayama, Saitama Pref., 22. VI. 1978 (K. SUZUKI); 1 ♀ (Paratype), Shino-saka, Shizuoka Pref., 25. VIII. 1972 (Y. NISHIKAWA).

Distribution: Japan (Hokkaido and Honshu).

Biological notes: This spider inhabits shores of the streams. Mature spiders appear in June and July, and the formation of egg sac is found in late July. The number of eggs averages 30 in one egg sac.

Remarks: This species resembles *P. boreus* TANAKA from Japan, *P. procurvus* (BÖSENBERG et STRAND), occurring in Japan, Korea and China, and *P. latitans* (BLACKWALL) from Europe. These separating characters are noted under the remarks of the *boreus*. This species is also allied to *P. yesoensis* from Japan; the discriminating characters are noted in the remarks of the latter species.

***Pirata yesoensis* TANAKA, 1985**

[Japanese name : Ashiguro-komorigumo]

(Figs. 37-40)

Pirata yesoensis TANAKA, 1985, p. 52; YAGINUMA, 1986, p. 169.

Female

Specimen measured: Holotype.

Measurements (mm). Total length 3.96. Carapace length 2.12, width 1.60.
Abdomen length 1.84, width 1.36.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.60	2.00	1.24	0.72	5.56
II	1.48	1.76	1.20	0.72	5.16
III	1.40	1.68	1.36	0.68	5.12
IV	2.04	2.44	2.24	0.92	7.64
Palp	0.68	0.84	—	0.56	2.08

Carapace yellowish brown, with dark brown markings and a very narrow dark brown line along margin; V-shaped mark distinct, greyish brown; yellow lateral bands separated from margins by dark brown bands. AER shorter than PMR; diameter of AME almost as large as ALE; AME separated from each other and from ALE by about half the diameter of AME; AER procurved. Clypeus brown, almost as high as the diameter of AME. Chelicerae, maxillae and labium yellowish brown. Sternum uniformly light yellowish brown. Abdomen yellowish brown, with blackish grey markings on dorsal and lateral sides; a lanceolate median mark distinct; venter light yellowish brown. Legs yellowish brown, except for black patellae and tibiae I. Palpi yellowish brown. Epigynum with a pair of oval structures at basal part and with large, round spermathecae which are seen through the body wall at apical part (Fig. 37); paired spermathecae, the basal one of which is round, and the apical one is oval, as shown in Fig. 38.

Male

Specimen measured: One of the paratypes; Sapporo, Hokkaido, 3. VIII. 1979 (H. TANAKA).

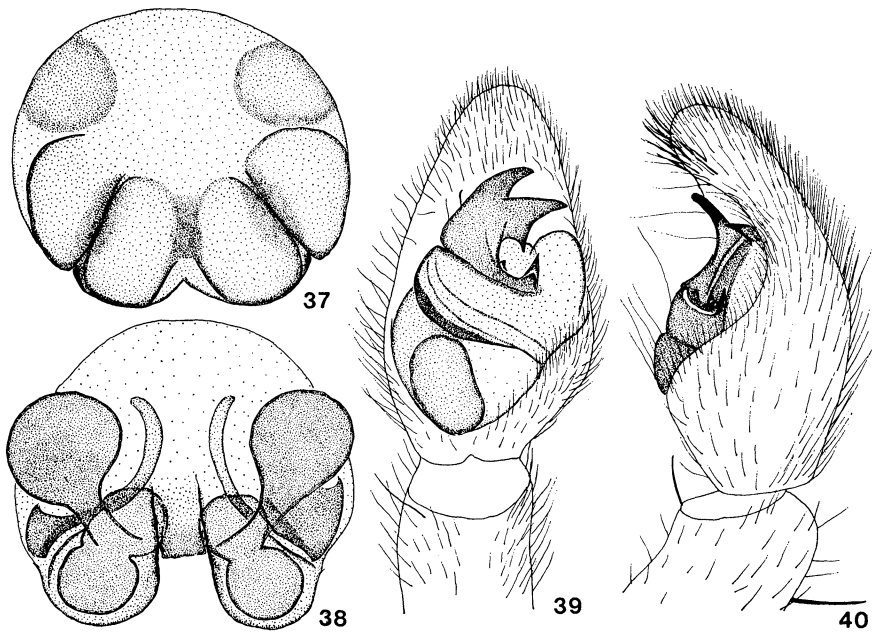
Measurements (mm). Total length 4.16. Carapace length 2.16, width 1.56.
Abdomen length 2.00, width 1.28.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.64	2.04	1.32	0.80	5.80
II	1.52	1.72	1.24	0.72	5.20
III	1.32	1.64	1.28	0.68	4.92
IV	1.92	2.48	2.12	0.88	7.40
Palp	0.80	0.84	—	0.72	2.36

Similar to the female, but differs from it with the dark yellowish brown palpi and with the tarsal organs having forked median apophysis (Figs. 39-40).

Variation: Total length ♀ 3.90-5.85, ♂ 3.60-4.20. Carapace length ♀ 1.85-2.20, ♂ 1.90-2.20; width ♀ 1.40-1.65, ♂ 1.30-2.00. Abdomen length ♀ 1.80-3.65, ♂ 1.60-2.00; width ♀ 1.35-2.55, ♂ 1.05-1.30.

Material examined: Hokkaido—2♀♀ (Paratypes), Sapporo, 1. IX. 1974 (F. KOMAI); 10♀♀ (Paratypes), same locality, 26-29. IX. 1974 (M. SUWA); 10♀♀ & 10♂♂ (Paratypes), same locality, 26. VI. 1975 (M. SUWA); 1♀ (Holotype, UOP), same locality, 3. VIII. 1979 (H. TANAKA); 27♀♀ & 1♂ (Paratypes), same



Figs. 37-40. *Pirata yesoensis* TANAKA. 37. Female epigynum (ventral view). 38. Female epigynum (dorsal view). 39. Male palp (ventral view). 40. Male palp (retrolateral view).

data as holotype; Honshu—2♀♀, Zao-onsen, Yamagata Pref., 15. VII. 1984 (H. YOSHIDA).

Distribution: Japan (Hokkaido and Honshu).

Biological notes: This species lives in damp areas among grasses in fields. Mature females appear from late in June to September and males from June to August. The formation of egg sac is found from August to September. The number of eggs is 30 in one egg sac on the average.

Remarks: This species is allied to the Japanese *P. tanakai* BRIGNOLI structurally, but is easily distinguished from the latter by the presence of black markings on patellae and tibiae I in both sexes.

***Pirata hirosii* TANAKA, 1986**

[Japanese name: Marunuma-komorigumo]

(Figs. 41-44)

Pirata hirosii TANAKA, 1986, p. 19, figs. 1-4.

Female

Specimen measured: Holotype.

Measurements (mm). Total length 1.80. Carapace length 3.05, width 2.05. Abdomen length 3.75, width 2.60.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	2.20	2.85	1.70	0.90	7.65
II	2.10	2.60	1.70	0.85	7.25
III	2.05	2.45	1.85	0.90	7.25
IV	2.75	3.40	2.55	0.85	9.55
Palp	1.00	1.20	—	0.90	3.10

Carapace yellowish brown, with dark brown markings and a very narrow dark brown line along margin; V-shaped mark distinct, dark brown; light yellow lateral bands separated from margins by dark brown bands. AER shorter than PMR; diameter of AME almost as large as ALE; AME separated from each other and from ALE by about half the diameter of AME; AER procurved. Clypeus reddish brown, almost as high as the diameter of AME. Chelicerae reddish brown, and with three teeth on retromargin. Maxillae and labium yellowish brown. Sternum yellowish brown, with a faint black markings. Abdomen reddish brown, with blackish grey markings and spots having white pubescence on dorsum; a lanceolate median mark very faint; lateral and dorsal

sides reddish brown. Legs yellowish brown, with indistinct annulations of femora and tibiae I-IV. Palpi uniformly yellowish brown; tarsus with one claw. Epigynum (Fig. 41) with mustache-shaped structure at the lower part and a pair of egglike spermathecae are seen through the body wall at the upper part; a pair of egglike spermathecae, and long and slender ones present as in Fig. 42.

Male

Specimen measured: Allotype.

Measurements (mm). Total length 4.90. Carapace length 2.55, width 1.85. Abdomen length 2.35, width 1.45.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	1.95	2.45	1.65	0.85	6.90
II	1.85	2.25	1.55	0.80	6.45
III	1.75	2.00	1.65	0.80	6.20
IV	2.45	2.85	2.65	1.10	9.05
Palp	0.85	0.80	—	0.90	2.55

Differences from the female are as follows: Carapace yellowish brown, with black markings. Clypeus blackish brown. Legs yellowish brown, with distinct annulations of femora and tibiae I-IV. Palpi reddish brown; tarsal organs (Figs. 43-44) with median apophysis having one hornlike projection at retro-lateral side.

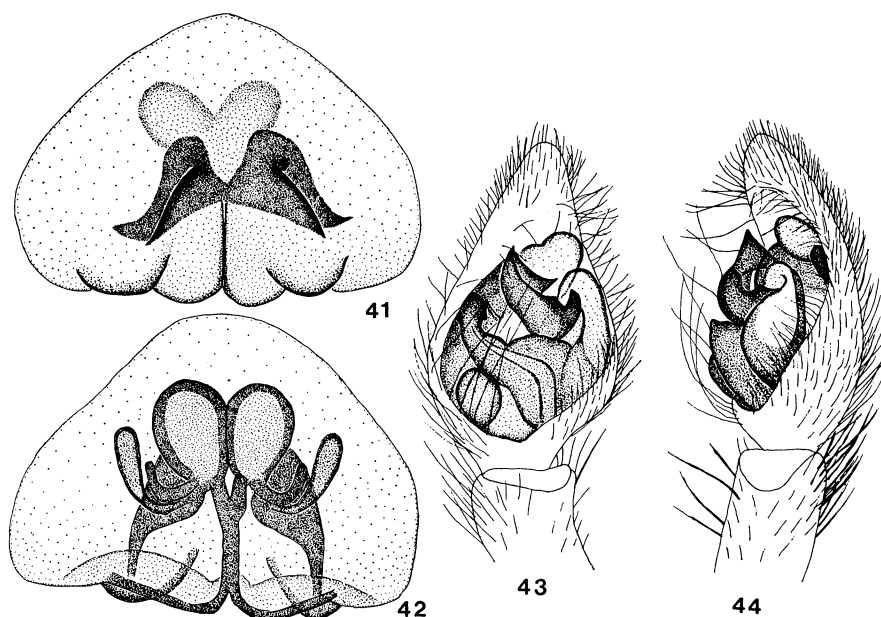
Variation: Total length ♀ 6.50-7.90, ♂ 4.50-5.35. Carapace length ♀ 2.75-3.10, ♂ 2.30-2.70; width ♀ 2.00-2.10, ♂ 1.60-1.90. Abdomen length ♀ 3.25-4.80, ♂ 2.20-2.65; width ♀ 2.10-3.35, ♂ 1.35-1.60.

Materials examined: Honshu—1♀ (Paratypes), same locality as holotype, 1. VI. 1983 (H. SAITO); 1♀ (Holotype, ASEA) and 1♂ (Allotype, ASEA), Maru-numa, Tone-gun, Gunma Pref., 24. VI. 1984 (H. TANAKA); 25♀♀ & 30♂♂ (Paratypes), same data as holotype.

Distribution: Japan (Honshu-Gunma Prefecture).

Biological notes: This spider lives along the streamlets of mountains. Mature spiders are found in June. The form of the egg sac, and the period of its formation have not been unknown.

Remarks: This species is allied to *P. hygrophilus* THORELL from Europe, but is distinguished from the latter by the absence of the septum on the female epigynum.



Figs. 41-44. *Pirata hiroschii* TANAKA. 41. Female epigynum (ventral view). 42. Female epigynum (dorsal view). 43. Male palp (ventral view). 44. Male palp (retrolateral view).

***Pirata piratellus* (STRAND, 1907)**

[Japanese name: Oto-komorigumo]

Tarentula (Pirata) piratella STRAND, 1907, p. 565; —, 1909, p. 64.

Pirata piratella: SAITO, 1941, p. 124; ROEWER, 1954, p. 283.

Pirata piratellus: BONNET, 1958, p. 3664; YAGINUMA, 1970, p. 667; TANAKA, 1974, p. 41; YAGINUMA, 1977, p. 395; —, 1986, p. 169.

Distribution: Japan (Honshu).

Remarks: The type-specimen of this species is no longer existent. Judging from the original description, this species seems to be nearest to *P. piraticus* (CLERCK), but it is separable from the latter by its larger body size and by its equal-sized AE. Although this species was described from Japan, I have seen no specimen.

***Pirata knorrii* (SCOPOLI, 1763)**

[Japanese name : Kunôru-komorigumo]

(Figs. 45-47)

Aranea Knorrii SCOPOLI, 1763, p. 403.*Pirata Knorri*: SIMON, 1876, p. 296; BECHER, 1882, p. 118.*Pirata Knorrii*: CHYZER and KULCZNSKI, 1891, p. 75; BÖSENBERG, 1903, p. 407, pl. 39, fig. 601; SAITO, 1934, p. 352, pl. 15, fig. 82; —, 1939, p. 72, fig. 9 (4); —, 1941, p. 122, fig. 139.*Pirata knorri*: DAHL, 1908, p. 296, fig. 32; F. and M. DAHL, 1927, p. 62, figs. 161-163; BONNET, 1958, p. 3659; SAITO, 1959, p. 58, fig. 7 (8), pl. 5, fig. 43, pl. 6, fig. 43; WIEBES, 1959, p. 64, figs. 89, 93; KEKENBOSCH, 1967, p. 261; FUHN and NICULESCU-BURLACU, 1971, p. 208, fig. 101; TYSTSCHENKO, 1971, p. 182; BUCAR and POLENEC, 1974, p. 84.*Lycosa knorri*: LESSERT, 1910, p. 501; SIMON, 1937, pp. 1118, 1140, fig. 1764.*Piratula knorrii*: ROEWER, 1954, p. 288.*Pirata knorrii*: YAGINUMA, 1970, p. 667; TANAKA, 1974, p. 42; YAGINUMA, 1977, p. 395; SOHN and PAIK, 1981, p. 20; PAIK and KIM, 1985, p. 69; YAGINUMA, 1986, p. 169.

Female

Specimen measured: Swedish Museum (No. 1469a) by THORELL.

Measurements (mm). Total length 7.00. Carapace length 3.10, width 2.20.

Abdomen length 3.90, width 2.35.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	2.50	3.05	1.95	1.00	8.50
II	2.30	2.75	1.90	1.00	7.95
III	2.20	2.55	2.15	0.95	7.85
IV	2.95	3.65	3.15	1.25	11.00
Palp	1.10	1.20	—	0.90	3.20

Carapace light yellowish brown, with darker markings and no line along the margin; V-shaped mark indistinct, brown; lateral light bands broad. AER shorter than PMR; AE of equal diameter; AME separated from each other by about equal diameter of AME, and from ALE by less than the diameter of AME; AER procurved. Clypeus light yellowish brown, shorter than the diameter of AME. Chelicerae dark reddish brown. Maxillae yellowish brown. Labium reddish brown. Sternum greyish brown, with color uniform. Abdomen greyish yellow; a lanceolate median mark distinct; lateral and ventral sides light greyish yellow. Legs yellowish brown with very faint annulations on

femora and tibiae I-IV. Palpi yellowish brown, with color uniform. Epigynum a pair of eyelike structures as in Fig. 45.

Male

Specimen measured: Swedish Museum (No. 1469a) by THORELL.

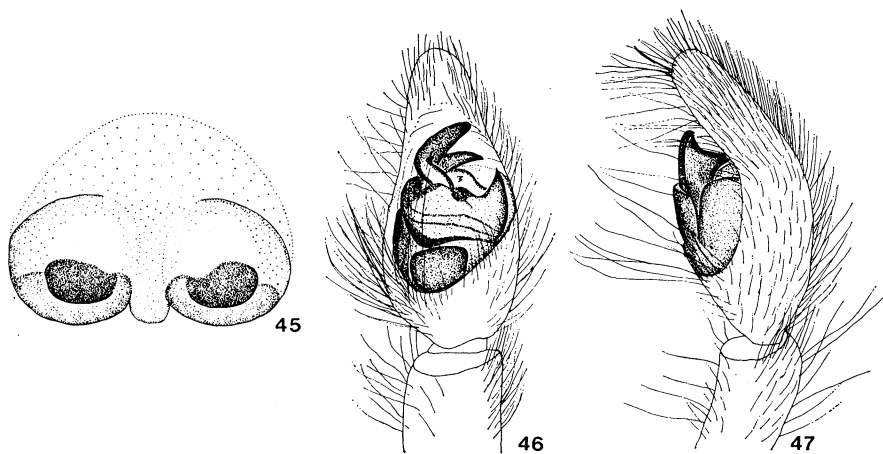
Measurements (mm). Total length 7.75. Carapace length 3.75, width 2.70. Abdomen length 4.00, width 2.25.

Leg	Femur	Patella & Tibia	Metatarsus	Tarsus	Total
I	3.35	4.50	3.15	1.45	12.45
II	3.50	4.45	3.40	1.45	12.80
III	3.15	3.65	3.25	1.30	11.35
IV	3.85	4.80	4.35	1.60	14.60
Palp	1.45	1.30	—	1.10	3.85

Similar to the female, but different in the following characteristics: Clypeus dark reddish brown. Maxillae and labium dark reddish brown, light yellowish brown at apex. Sternum dark reddish brown, with a narrow light yellowish brown line at central region. Legs reddish brown, with many long hairs pointed straight outward on all legs. Palpi; tarsal organs (Figs. 46-47) with a robust median apophysis bearing a long projection outward.

Distribution: Japan (Hokkaido), Korea, and Europe.

Biological notes: unknown.



Figs. 45-47. *Pirata knorrii* (SCOPOLI). 45. Female epigynum (ventral view). 46. Male palp (ventral view). 47. Male palp (retrolateral view).

Remarks: The present species resembles *P. clercki* (BÖSENBERG et STRAND), but is easily distinguished from the latter by the male median apophysis bearing a long projection outwards. Although SAITO (1934) recorded this European species from Hokkaido, Japan, I have not been able to examine the Japanese specimens. I am keeping it in the Japanese list until the Japanese specimen can be examined. The description of this species is given by the samples of the Swedish Museum (No. 1469a ♀ ♂) collected by THORELL (No. 235).

摘 要

田中穂積 (〒581 私立金光八尾高等学校, 八尾市柏村町): 日本のコモリグモ I. *Pirata* 属。
日本から得られた *Pirata* 属に含まれる13種の再記載を行った。それらの種は以下のとおりである。

Pirata piraticus (カイゾクコモリグモ), *P. subpiraticus* (キバラコモリグモ), *P. clercki* (クラークコモリグモ), *P. yaginumai* (ナミコモリグモ), *P. piratoides* (イモコモリグモ), *P. meridionalis* (ミナミコモリグモ), *P. boreus* (ハテコモリグモ), *P. procurvus* (チビコモリグモ), *P. tanakai* (コガタコモリグモ), *P. yesoensis* (アングロコモリグモ), *P. piratellus* (オトコモリグモ), *P. knorrii* (クノールコモリグモ), *P. hiroschii* (マルヌマコモリグモ)。

References

- AGASSIZ, L.*, 1848. Nomenclatoris zoologici Index Universalis, continens Nomina systematica Classium, Ordinum, Familianum at Generum Animalium omnium, tam viventium quam fossilium. 1135 pp. Soloduri.
- BANKS, N.*, 1905. Synopses of North American invertebrates. XX. Families and genera of Araneida. *Amer. Nat.*, **39**: 293-323.
- *, 1907. A preliminary list of the Arachnida of Indiana, with keys to families and genera of spiders. *Rep. Indiana Geol. Surv.*, **31**: 715-747.
- BECKER, L., 1881. Descr. de deux nouv. *Lycoses* amér. *Ann. Soc. Ent. Belg.*, **25**: 44-47.
- *, 1882. Les Arachnides de Belgique. *Ann. Mus. roy. hist. nat. Belg.*, **10**: 1-246.
- BERLAND, L.*, 1932. Les Arachnides (Scorpions, Araignées, etc.). *Encyclopédie ent. Paris*, **16**: 1-435.
- BLACKWALL, J., 1861. A History of the Spiders of Great Britain and Ireland. 174 pp., London.
- BONNET, P., 1958. Bibliographia Araneorum. II (4). 1203 pp., Toulouse.
- BÖSENBERG, W., 1901. Die Spinnen Deutschlands, I. *Zoologica, Stutt.*, **14**: 1-96.
- *, 1903. Die Spinnen Deutschlands, V, VI., *Ibid.*, **14**: 385-465.
- BÖSENBERG, W. and E. STRAND, 1906. Japanische Spinnen. *Abh. Senck. naturf. Ges.*, **30**: 93-442.

* not seen.

- BRAENDEGAARD, J., 1958. The Zoology of Iceland. III (54). Araneida. 113 pp. Copenhagen and Reikjavik.
- BRIGNOLI, W., 1983. A Catalogue of the Araneae Described between 1940 and 1981. 755 pp., Manchester Univ. Press.
- BUCHAR, J. and A. POLENEC, 1974. Zur Lycosiden Fauna Jugoslawiens (Araneae: Lycosidae). *Vest. Cs. Spol. Zool.*, 38(2): 81-85.
- CHAMBERLIN, R.V.*, 1908. Revision of North American spiders of the family Lycosidae. *Proc. Acad. nat. Sci. Philad.*, 60: 158-318.
- CHARITONOW, D.E.*, 1932. Arachnologica varia. IV. Über einige Gattungen und Typenarten der Lycosiden. *Izw. biol. Inst. Perm.*, 8(1): 19-24.
- CHEN, Z. et al., 1979. Spiders from Paddy Fields. Zhejiang People's Press. 175 pp. Zhejiang.
- CHYZER, C. and W. KULCZYNSKI*, 1891. Araneae Hungariae. Tomus I: Salticoidae, Oxyopoidae, Lycosoidae, Heteropodoidae, Misumenoidae, Euetrioidae, Tetragnathoidae, Uloboroidae, Pholcoideae, Scytodoidae, Urocteoidae, Eresoidae, Dictynoidae. 170 pp. Budapest.
- CLERCK, C.*, 1758. Aranei Suecici, Descriptionibus et Figuris Oeneis Illustrati, ad Genera Subalterna Redacti Speciebus Ultra LX Determinati. 154 pp. Stockholmiae.
- COMSTOCK, J.H.*, 1912. The evolution of the webs of spiders. *Ann. ent. Soc. Amer.*, 5: 1-10.
- *, 1913. The Spider Book; A Manual for the Study of the Spiders and Their Near Relatives, the Scorpions, Pseudoscorpions, Whipscorpions, Harvestmen and Other Members of the Class Arachnida, Found in America North of Mexico, with Analytical Keys for Their Classification and Popular Accounts of Their Habits. 721 pp. Garden City.
- CROSBY, C.R. and S.C. BISHOP*, 1928. Araneae. In: A list of the insects of New York. *Cornell Univ. Agr. Exp. Sta. Mem.*, 101: 1034-1074.
- DAHL, F.*, 1883. Analytische Bearbeitung der Spinnen Norddeutschlands mit einer anatomisch-biologischen Einleitung. *Schr. naturw. Ver. Schl.-Holst.*, 5(1): 13-74.
- *, 1908. Die Lycosiden oder Wolfsspinnen Deutschlands und ihre Stellung im Haushalt der Natur. Nach statistischen Untersuchungen dargestellt. *N. Act. Acad. Caes. Leop.-Carol.*, 88: 175-678.
- *, 1912. Über die Fauna des Plagefenngebietes. *Beitr. Naturdenk.*, 3: 575-622.
- DAHL, F. and M. DAHL, 1927. Spinnentiere oder Arachnoidea. II. Lycosidae s. lat. (Wolfsspinnen im weiteren Sinne). *Tierw. Deuts.*, 5: 1-80.
- DOLESCHALL, C.L.*, 1852. Systematisches Verzeichniss der im Keiserthum Oesterreich vorkommenden Spinnen. *Sitz.-ber. Akad. Wiss. Wien*, 9: 622-651.
- EMERTON, J.H., 1885. New England Lycosidae. *Trans. Connect. Acad. Arts Sci.*, 6: 481-505.
- *, 1909. Supplement to the New England spiders. *Trans. Connect. Ac. Sci.*, 14(3): 171-236.
- ERICHSON, G.F.*, 1845. Nomina systematica Generum Arachnidarum. In: AGASSIZ

- "Nomenclator zoologicus". *Soloduri*, 1845: 1-14.
- FALCONER, W.*, 1910. Keys to families and genera of British spiders, and the families, genera and species of British harvestmen and pseudoscorpions. *Naturalist*, 1910 (641): 233-243; (644): 323-332; (647): 438-447.
- FOX, I., 1935. Chinese spiders of the family Lycosidae. *Journ. Wash. Acad. Sci.*, 25: 451-456.
- FUHN, I.E. and F. NICULESCU-BURLACU, 1971. Fauna Republici Socialiste România. Arachnida, 3(3) Fam. Lycosidae. 251 pp. Bucuresti.
- GERTSCH, W.J. and H.K. WALLACE, 1937. New American Lycosidae with notes on other species. *Amer. Mus. Novit.*, (919): 1-22.
- HAHN, C.W.*, 1831. Die Arachniden. Erster Band. 129 pp. Nürnberg.
- HANSEN, H.J.*, 1882. Spindeldyr (Arachnoidea). In: SCHIÖDTE, J.C., Zoologia Danica 3. 131 pp.
- HOLM, Å.*, 1947. Egentliga Spindlar. Araneae fam. 8-10. Oxyopidae, Lycosidae och Pisauridae. *Svensk. Spindelfauna*, 3: 1-48.
- HU, J., 1948. The Chinese Spiders Collected from the Fields and the Forests. Tianjin Press of Science and Techniques. 482 pp. Tianjin.
- KASTON, B.J., 1938. Notes on little known New England spiders. *Canad. Ent.*, 70: 12-17.
- , 1948. Spiders of Connecticut. *Connect. Geol. and nat. Hist. Survey Bull.*, 70: 1-874.
- KEKENBOSCH, J., 1967. Note sur les espèces Belges du genre *Pirata* (Araneae, Lycosidae). *Bull. Ann. Soc. roy. ent. Belg.*, 103: 260-264.
- KEYSERLING, E.*, 1877. Spinnen aus Uruguay und Gegenden Amerikas. *Verh. Zool. Bot. Ges. Wien*, 27: 571-624.
- KOCH, C.L.*, 1848. Die Arachniden. Vierzehnter Band. 210 pp. Nürnberg.
- *, 1851. Uebersicht des Arachnidensystem. Heft 5. 104 pp. Nürnberg.
- KRATOCHVIL, J.*, 1930. Beiträge zur Kenntniss der westmährischen Salticiden und Lycosiden. *Sborn. Klubu Prirod. Brne*, 13: 1-5.
- KRONESTEDT, T., 1980. Comparison between *Pirata tenuitarsis* SIMON, new to Sweden and England, and *P. piraticus* (CLERCK), with notes on taxonomic characters in male *Pirata* (Araneae: Lycosidae). *Ent. Scand.*, 11: 65-77.
- LESSERT, R., 1910. Catalogue des Invertébrés de la Suisse. Fasc. 3. Araignées. 635 pp. Genève.
- LOCKET, G.H. and A.F. MILLIDGE, 1951. British Spiders. Vol. 1. 310 pp. London.
- LUCAS, H.*, 1846. Histoire Naturelle des Animaux Articulés. In: Exploration Scientifique de l'Algérie Pendant les années 1840, 1841, 1842, Publiée par Ordre du Gouvernement et avec le Concours d'une Commission Académique. Sciences physiques, Zoologie. 5 tomes. Paris, 1846-1850.
- MARSCHALL, A.*, 1873. Nomenclator Zoologicus, Continens Nomina Systematica Generum Animalium tam Viventum quam Fossilium, Secundum, Ordinem Alphabeticum Disposita. 482 pp. Vindobonae.
- MARX, G.*, 1890. Catalogue of the described Araneae of Temperate north America.

- Proc. U.S. nat. Mus.*, 12: 497-594.
- MENGGE, A.*, 1879. Preussische Spinnen. X. Fortsetzung. *Schr. naturf. Ges. Danzig*, (N.F.) 4: 495-542.
- MONTGOMERY, Jr., Th. H.*, 1902. Descriptions of Lycosidae and Oxyopidae of Philadelphia and its vicinity. *Proc. Acad. nat. Sci. Philad.*, 54: 534-592.
- *, 1904. Descriptions of north American Araneae of the families Lycosidae and Pisauridae. *Ibid.*, 56: 261-323.
- NAMKUNG, J., 1976. A supplemental list of Korean spiders. *Kor. J. Pl. Prot.*, 15(2): 83-87.
- OHLERT, E.*, 1851. Beiträge zur Diagnose und Revision der preussischen Spinnengattungen. *Off. Prüf. Schül. höh. Burg.*, 15. April 1851: 1-8.
- *, 1867. Die Araneiden oder echten Spinnen der Provinz Preussen. 172 pp. Leipzig.
- OLIVIER, G. A.*, 1789. Araignée, Aranea. *Encycl. méth., Hist. nat., Ins. Paris*, 1789(4): 173-240.
- PAIK, K. Y., 1979. Spider Fauna of Mt. Pargong Taegu, Korea. Theses Coll. Commem. Sixtieth Birthday of Prof. J. H. LEE. 161-213 pp.
- PAIK, K. Y. and J. KIM, 1985. A list of Korean spiders (revised in 1985). *Arachnol. Inst. Korea*, 1(1): 51-82.
- PAIK, W. H. and J. NAMKUNG, 1979. Study of Farm Spiders of Korea. Seoul Univ. Press. 101 pp. Seoul.
- PALMGREN, P., 1939. Die Spinnenfauna Finnlands. I. Lycosidae. *Act. Zool. Fenn.*, 25: 1-86.
- PETRUNKOVITCH, A.*, 1925. Arachnida from Panama. *Trans. Connect. Acad. Arts Sci.*, 27: 51-248.
- , 1928. Systema Araneorum. *Ibid.*, 29: 1-270.
- REIMOSER, E.*, 1928. Einheimische Spinnen. 1. u. 2. *Die Natur (Wien)* 4(5): 103-108.
- ROEWER, C. F., 1928. Araneae, Echte oder Webspinnen. In: *Die Tierwelt Mitteleuropas*. 144 pp. Leipzig.
- *, 1932. Arachnoidea, Spinnentiere. In: BROHMER, P., *Fauna von Deutschland*. 404-432 pp. Leipzig.
- , 1954. Katalog des Araneae von 1758 bis 1940, bzw. 2a: 1-923; 2b: 925-1751. Bruxelles.
- , 1955. Die Araneen der österreichischen Iran-Expedition 1949/50. *Sitz.-ber. Osterr. Akad. Wiss., Mathem.-naturw. Kl.*, I. 164: 751-782.
- , 1959. Exploration du Parc National de l'Upemba. Araneae Lycosaeformia II (Lycosidae). *Ibid.*, 55: 519-1040.
- SAITO, S., 1934. Spiders from Hokkaido. *J. Fac. Agr. Hokkaido Imp. Univ.*, 33: 267-362.
- , 1939. On the spiders from Tohoku (Northern most Part of the Main Island), Japan. *Saito Ho-on Kai Mus. Res. Buss.*, 18: 1-91.
- , 1941. Suborder Arachnomorphae. Tetrasticta-Trionycha II. (Arachnoidea-Araneina). In: OKADA et al., *Fauna Nipponica* 9(2-2). 220 pp. Sanseido, Tokyo.

- , 1959. The Spider Book Illustrated in Colours. 194 pp. Hokuryukan, Tokyo.
- SAVORY, T.H.*, 1926. British Spiders: Their Hounts and Habits. 180 pp. Oxford.
- *, 1935. The Arachnida. 218 pp. London.
- SCHEFFER, T.H.*, 1904. Four new spiders from Kansas. *Ent. News*, 15: 257-260.
- SCHEURING, L.*, 1914. Die Augen der Arachnoideen. II. *Zool. Jahrb. Anat.*, 37: 369-464.
- SCHLECHTENDAL, H.R.*, 1881. Die Gliederfüssler mit Ausschluss der Insekten. Eine Anleitung zur Kenntniss Derselben. Die Spinnentiere. 116 pp. Leipzig.
- SCOPOLI, J.A.*, 1763. Entomologia Carniolica, Exhibens Insecta Carniolae Indigena et Distributa in Ordines, Genera, Species, Varietates. Methodo Linnaeana. 420 pp. Vindobonae.
- SCUDDER, S.H.*, 1882. Nomenclator Zoologicus. An alphabetical list of all generic names that have employed by naturlists for recent and animals from the earliest times to the close of the year 1879. Washington.
- SHERBORN, C.D.*, 1922. Index Animalium, Sive Index Nominum Quae ab A.D. 1758 Generibus et Speciebus Animalium Imposita Sunt. Societatibus Eruditorum Adjuvantibus a Carolo Davis SHERBORN Confectus. Sectio II, A Kalendis Januariis 1801 Usque ad Finem Decembris 1850. Part I, Bibliography and Index Nominum Animalium. 7056 pp. London.
- *, 1932. Index Animalium, Sive Index Nominum quae ab A.D. 1758 Generibus et Speciebus Animalium Imposita Sunt. Societatibus Eruditorum Adjuvantibus a Carolo Davis SHERBORN Confectus. Sectio II, A Kalendis Januariis 1801 Usque ad Finem Decembris 1850. Part II. Index to Generic Names Showing the Trivial Names Associated with each, from 1801 to 1850. 1098 pp. London.
- SHIMATCHKO, J.*, 1861. Verzeichniss der in der Umgegend von S.-Petersburg vorkommenden Arachniden. *Horae Soc. ent. Ross.*, 1: 117-137.
- SIMON, E.*, 1864. Histoire Naturelle des Araignées (Aranéides). 540 pp. Paris.
- *, 1876. Les Arachnides de France. Tom 3. 360 pp. Paris.
- , 1898. Histoire naturelle des Araignées. 2(2): 193-380.
- *, 1937. Les Arachnides de France. Tom VI. Synopsis Général et Catalogue des Espèces Françaises de L'ordre des Araneae, 5^e et Dernière Partie. 979-1298 pp. Paris.
- SMITH, F.P.*, 1901. The structure of spiders and the habits of some well-known spiders. *Nat. Journ. Guide*, 10: 66-69, 102-105, 136-141, 191-196.
- *, 1902. An introduction to British spiders. *Sci. Gossip*, (N.S.) 8: 234-236, 264-266, 297-299, 329-332.
- *, 1907. Vagabond spiders. *Journ. Quek. Micr. Cl.*, (2) 10: 90-92.
- SOHN, S.R. and K.Y. PAIK, 1981. On the unreported species of *Pirata medionalis* and genus *Pirata* (Lycosidae, Araneae) from Korea. *Korean J. Zool.*, 24(1): 19-25.
- SONG, D.X., DANG, D.W., WANG, R.M., CHENG, Z.F. and S.X. ZHENG, 1978. On the wolf spiders from farm fields in Chekiang province. *Zool. Mag.*, 1978(2): 1-5.
- STONE, W.*, 1890. Pennsylvania and N.W. Jersey spiders of the family Lycosidae. *Proc. Acad. nat. Sci. Philad.*, 1890: 420-434.
- STRAND, E.*, 1906. Isländische Arachniden. *Jahrb. nassau. Ver. Naturk.*, 59: 279-284.

- , 1907. Vorläufige Diagnosen süd- und ostasiatischer Clubioniden, Ageleniden, Pisauriden, Lycosiden, Oxyopiden und Salticiden. *Zool. Anz.*, 31: 558-570.
- , 1916. Zur Kenntnis japanischer Spinnen I, II. *Arch. Naturg.*, 82 (A: 11): 73-90, 91-113.
- SUNDEVALL, J.C.*, 1833. Conspectus Arachnidum. *Londini Gothrum*, 1833: 1-39.
- TACZANOWSKI, L.*, 1866. Spis Pajakow zebranych w okolicach Warszawy w ciagu roku 1865. *Wyk. Szkoly Glow. Warsz.*, 5: 1-14.
- TANAKA, H., 1974. Japanese wolf spiders of the genus *Pirata*, with descriptions of five new species (Araneae: Lycosidae). *Acta arachnol.*, 26: 22-45.
- , 1980. A revision of two Japanese spiders of the genus *Pirata* (Araneae: Lycosidae). *Ibid.*, 29: 1-2.
- , 1985. Descriptions of new species of the Lycosidae (Araneae) from Japan. *Ibid.*, 33: 51-87.
- , 1986. A new species of the genus *Pirata* SUNDEVALL (Araneae: Lycosidae) from Japan. *Proc. Japn. Soc. syst. Zool.*, (33): 19-22.
- THORELL, T.*, 1856. Recensio critica Araneorum Suecicarum, quas descripserunt Clerckius, Linnaeus, de Geerus. *N. Act. reg. Soc. sci. Upsal.*, (3) 2: 61-176.
- *, 1870. On European Spiders. *Ibid.*, (3) 7: 109-242.
- *, 1872. Remarks on synonyms of European spiders. Part III. 229-374 pp. Upsala.
- TYSTSCHENKO, V.P., 1971. Classification of Spiders of the European Part of the USSR. 281 pp. Leningrad.
- WALCKENAER, C.A.*, 1805. Tableau des Aranéides ou Caractères Essentiels des Tribus, Genres, Familles et Races que Renferme le Genre Aranea de LINNE, avec la Désignation des Espèces Comprises dans Chacune de ces Divisions. 88 pp. Paris.
- , 1837. Histoire Naturelle des Insectes. Aptères. Tome I. 682 pp. Paris.
- WALLACE, H.K. and H. EXLINE, 1977. Spiders of the genus *Pirata* in North America, Central America and the West Indies (Araneae: Lycosidae). *J. Arachnol.*, 5: 1-112.
- WANG, F.Z. and Z.D. ZHU, 1963. List of Chinese spiders. *Jilin yike daxue xue bao*, 5: 381-459.
- WANG, J., 1981. Protection and Utilization of Spiders in Paddy Fields. 188 pp. Hunan Press of Science and Techniques.
- WIEBES, J.T., 1959. The Lycosidae and Pisauridae (Araneae) of the Netherlands. *Zool. Verh., Leiden*, 42: 1-78.
- YAGINUMA, T., 1960. Spiders of Japan in color. 197 pp. Hoikusha, Osaka.
- , 1961. Spiders from the Tokara Islands. *Bull. Osaka Mus. nat. Hist.*, (13): 81-86.
- , 1970. The spider fauna of Japan (revised in 1970). *Bull. Natn. Sci. Mus.*, 13: 639-701.
- , 1977. A list of Japanese spiders (revised in 1977). *Acta arachnol.* (Spe. no.), 27: 367-406.
- , 1986. Spiders of Japan in Color. New edition. 305 pp. Hoikusha, Osaka.

- ZHU, C.D., 1983. List of Chinese spiders (revised in 1983). *J. Bethune Med. Univ.* **9**: 1-130.